Electrical World

AUGUST 24, 1940

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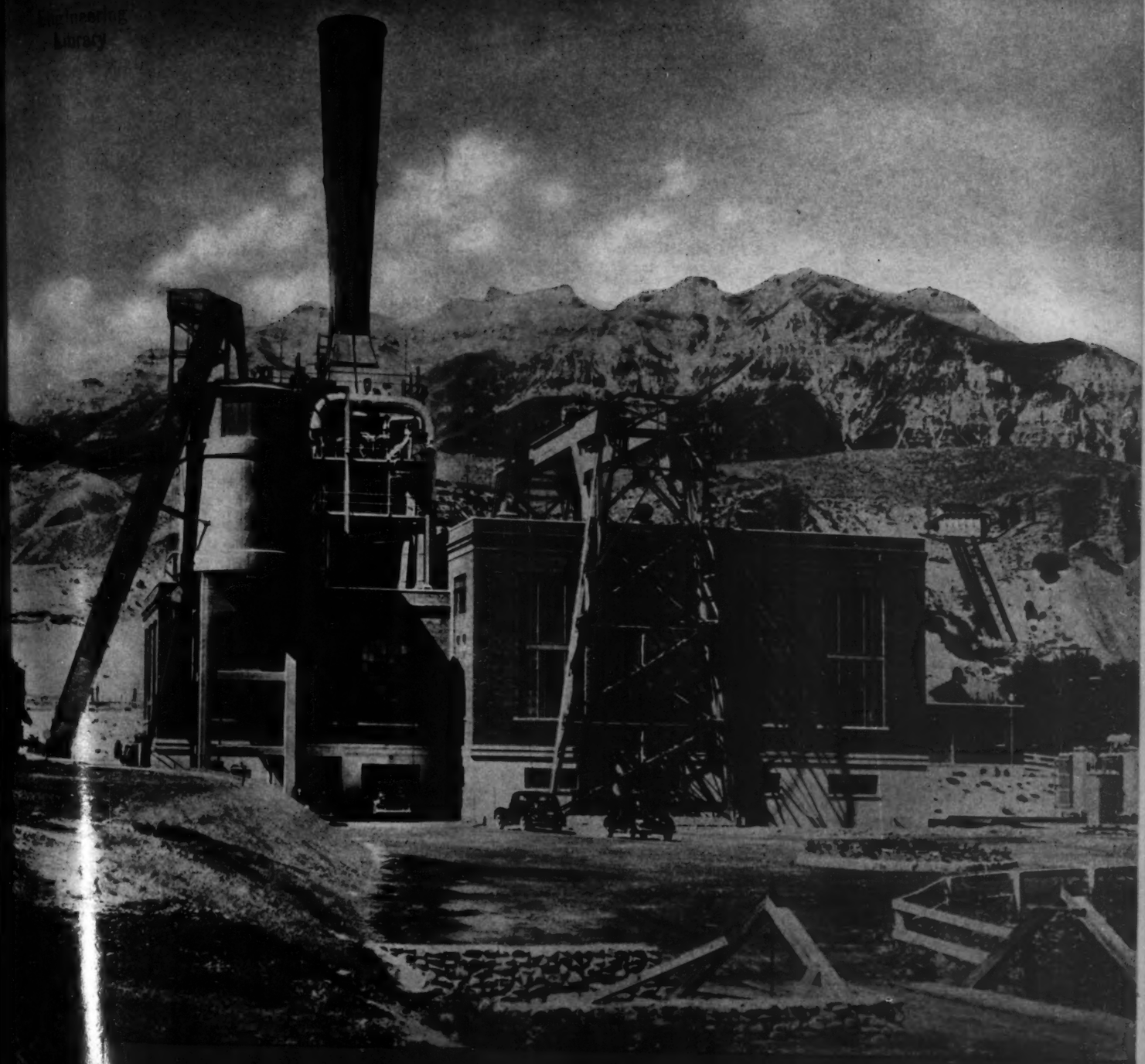

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August 24, 1940

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Editorial and Executive Offices
330 West 42d Street, New York, N. Y.

JAMES H. McGRAW, Jr.....President
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Return to Principles

Reasonable severance damage compensation, although not specifically stated as such in the verdict, was awarded early this month to the Puget Sound Power & Light Company in condemnation proceedings brought by the Whatcom County Public Utility District before the federal court at Bellingham, Wash. The PUD sought to purchase by condemnation a part of the utility system at a price based on asserted reproduction cost of around $4,400,000 and current value of no more than $3,000,000. The price fixed by the court was $5,000,000. The difference between this price and any lesser amount within the range from the asserted current value to the estimated reproduction cost obviously consists of severance compensation, although it is not so identified.

It is significant to observe that the verdict was reached by twelve men in a jury, not by one man in the person of a judge. The decision thus may be taken as more free from strictly legalistic determination than it might be regarded if it were the pronouncement of one man trained in the law and respeetful of its utmost letter.

What the members of the jury said was what all thinking men know. They said that the whole is greater than the sum of its parts. They left the mathematical axiom that the whole is equal to the sum of its parts where it belongs — in arithmetic. They recognized that arithmetic is not life, that when the whole is a functioning entity, either a living organism or an organization of men, money and things, then it is not the parts that give value to the whole, but, oppositely, it is the whole that gives value to the parts.

One man with a rifle is less than the same man with the same rifle standing in the ranks with his fellows. Controlled and used as an entity, an army is much more than the total number of men in it, each man on his own.

This nation is greater than 48 states. To take one state from the nation is to remove more than just an area of land with the people and the property on it. The functioning of the national economy would be affected.

So it is also in business. To cut out one part of an operating business property is to cripple the remaining part in greater or less degree.

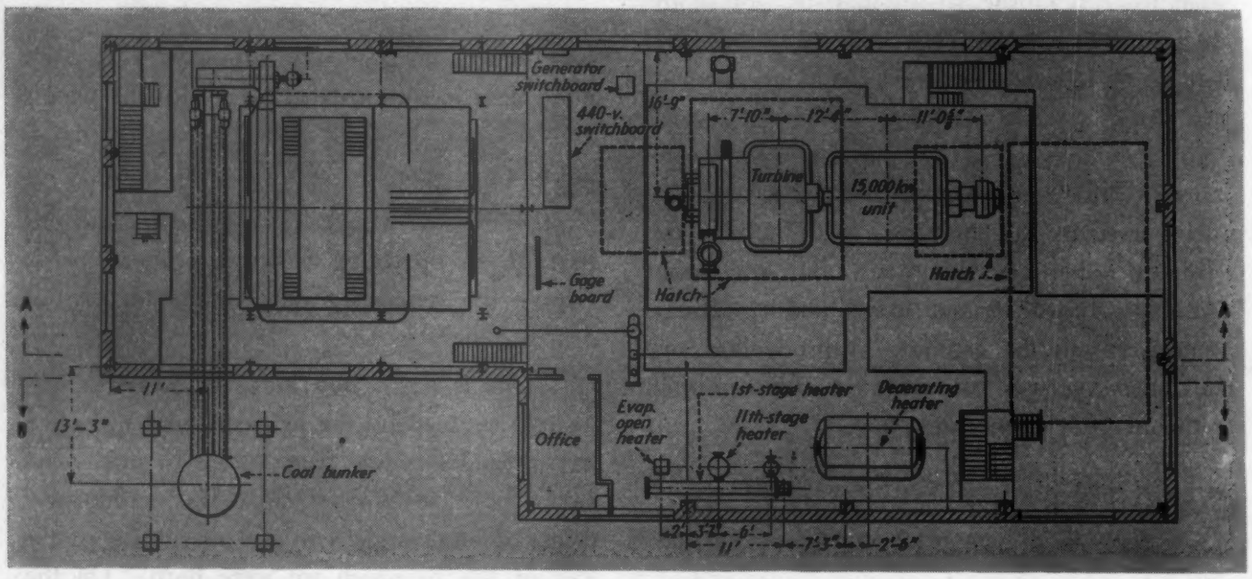
This is not a new idea. It is not a new thought evolved by the brilliant, and too often irresponsible, minds from which in late years have come so many magisterial pronouncements of notions alien to and disruptive of the way of life to which we were born. On the contrary, the jury in that court at Bellingham saw in the cause before them a principle, a fundamental truth, long accepted in the affairs of men. They saw this principle; they recognized it; they stated it.

As a nation we march with the other nations of our time. All nations, to large or small extent — we less than many others, thank Providence — have denied the principles of the past and have sought to replace them with new rules and animations for human behavior. But eventually the denials will fail, the false gods will be cast down and men will return to the truths their fathers lived by. We take the verdict in this case as an indication of a turning in that direction.

Steam Station Designed as Hydro Adjunct

Semi-outdoor plant with minimized investment for low load-factor service — Chain-grate stoker burns Utah coal — Hydro tailwater is used for condensing

S. B. FLAGG, Ebasco Services, Inc., New York*



STATION ARRANGEMENT results in compact floor plan with minimum building height; height of turbine room kept low by adoption of four ceiling hatches (dotted lines) and outdoor traveling crane

OREM steam station exemplifies a design contrived to meet a number of influencing factors. It serves as an adjunct to a hydro system and may therefore have a relatively low utilization or plant factor. It was designed to have low investment per kilowatt and therefore lacks heat traps that would be justified in a plant continuously operated under heavy loads or with more expensive fuel. It pioneered in using a forced-draft, traveling-grate stoker for Utah coal. Performance so far has shown good availability of generating facilities, as a whole, and good economy. It lends itself well to good station housekeeping and externally presents attractive appearance in keeping with its environment. The discharge from nearby hydro station† is ample for present condensing water requirements and provision has been made for recirculation if and when steam station is expanded.

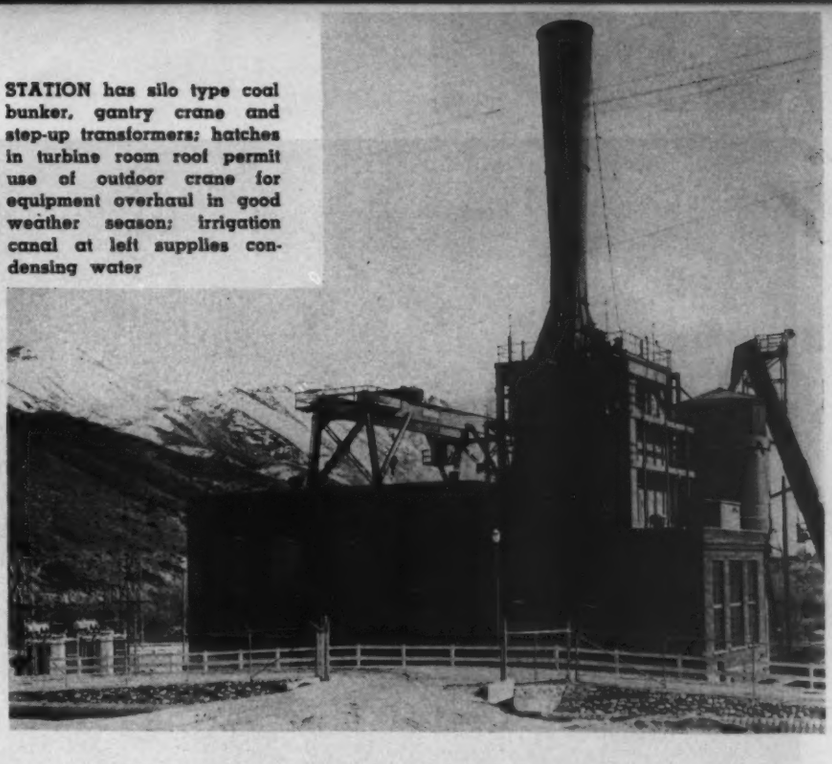
Utah Power & Light Company provides electric service to most of the cities and towns in Utah as well as to a considerable area in southern Idaho and, through subsidiary companies, serves certain parts of western Colorado and southwestern Wyoming. In Idaho and Utah its transmission lines extend from the agricultural area on the north for a distance of about 350 miles into the coal-mining region in Carbon and Emery counties in southern Utah. Sales of energy to copper and other mineral industries constitute a large part of its total business.

The company's principal generating facilities are included in five hydro-electric stations located along the Bear River, which flows from the outlet of Bear Lake in southern Idaho southward into Great Salt Lake. There are also a considerable number of small hydro stations on lesser streams and two steam-electric stations which deliver energy into the interconnected system. In addition to energy derived from its own stations, Utah company purchases from Idaho Power Company, with which its lines connect in the north.

In periods of good precipitation the hydro-electric energy available from Utah's own plants and by purchase from Idaho leaves relatively

*Mechanical engineer.

†See cover picture for additional view of plant showing location of hydro plant.



STATION has silo type coal bunker, gantry crane and step-up transformers; hatches in turbine room roof permit use of outdoor crane for equipment overhaul in good weather season; irrigation canal at left supplies condensing water

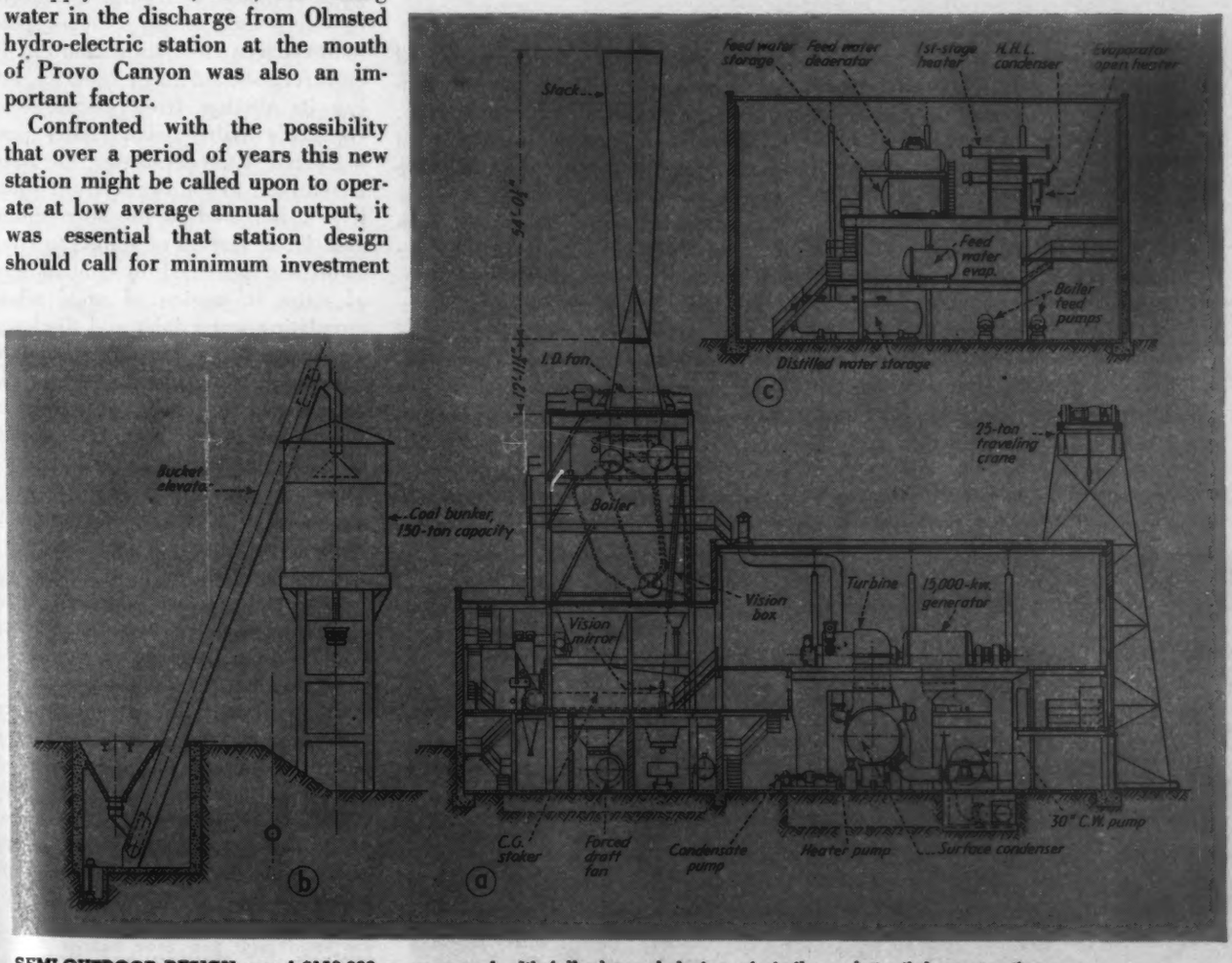
little to be supplied by steam stations. However, for some years past precipitation on the watersheds tributary to the company's hydro-electric stations has been subnormal, as is strikingly evidenced by the unprecedented low level to which Great Salt Lake declined. Because of this long-continued dry period and of rapidly growing system loads on account of activity in metals production, the need for steam-generated energy was expected to exceed the capability of Utah's Jordan station in Salt Lake City. This led in 1935 to the decision to build Orem. Ground was broken January, 1936, and the station went into trial operation in August of the same year—a construction period of seven to eight months.

Semi-Outdoor Design

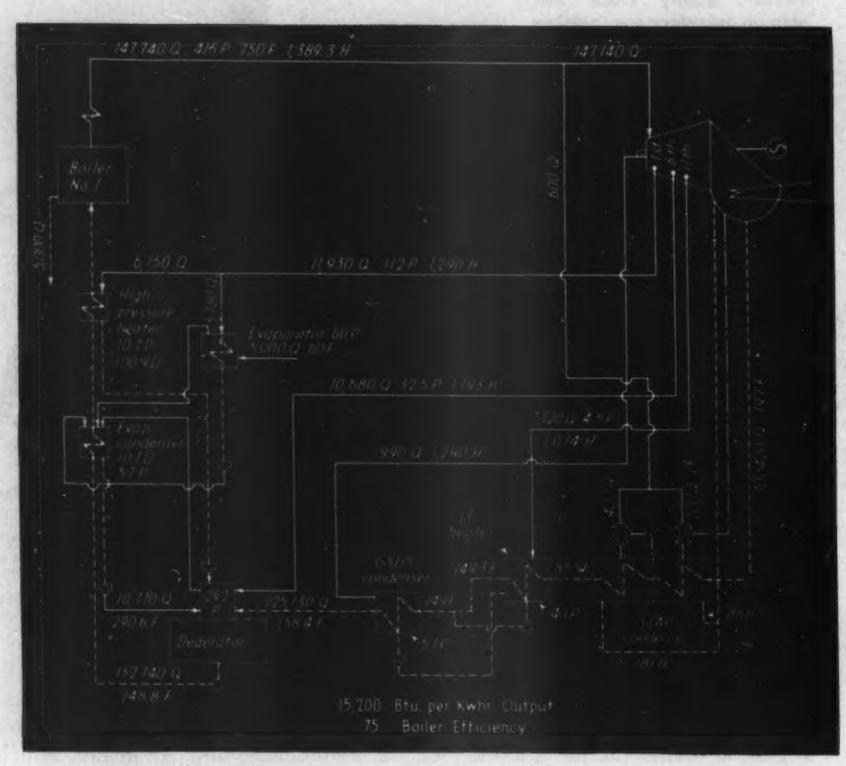
Selection of a site south of Salt Lake was influenced in part by transmission conditions, but also by relatively low freight rate on coal from Carbon County fields; availability of a supply of clear, cool, condensing water in the discharge from Olmsted hydro-electric station at the mouth of Provo Canyon was also an important factor.

Confronted with the possibility that over a period of years this new station might be called upon to operate at low average annual output, it was essential that station design should call for minimum investment consistent with fairly low operating costs.

This important consideration largely accounts for the adoption of a semi-outdoor design which, at that time, had been little used by utilities, especially in regions with low winter temperatures. It also explains the omission from boiler plant of economizer and air heater, which would have been justified even with expected moderate fuel prices, had



SEMI-OUTDOOR DESIGN saved $150,000 as compared with fully housed design of similar substantial construction; only the stoker and the lower part of the boiler are below the roof

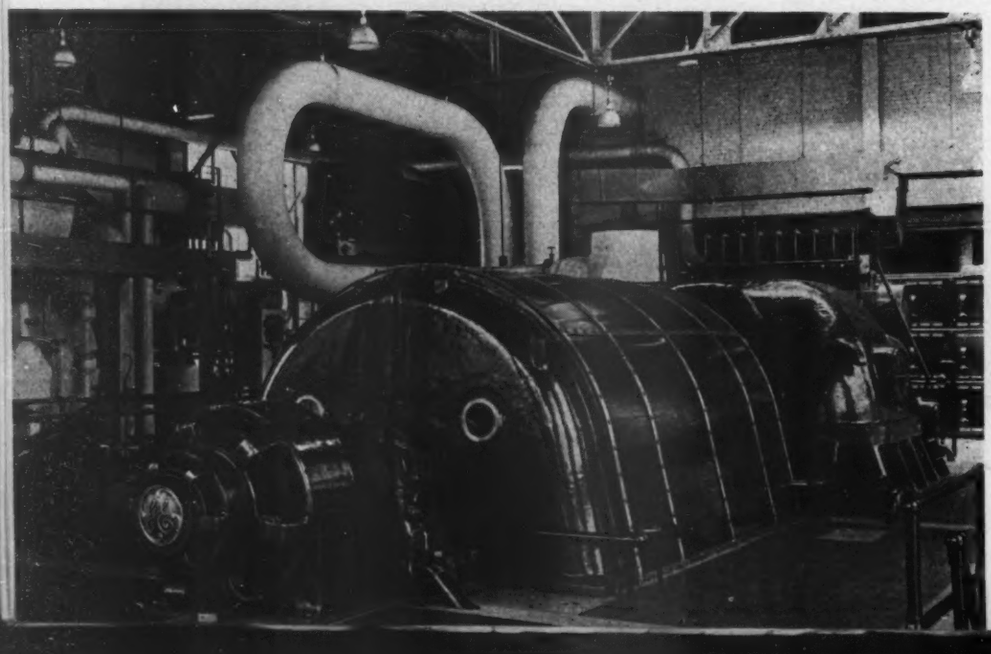


ECONOMY OF 15,200-B.t.u. per kilowatt-hour at 15,000 kw. load, with 1-in. absolute back pressure and 75 per cent boiler efficiency; average economy for 4,200 hours of actual operation in 1939 was 15,550 B.t.u. per net kilowatt-hour

there been certainty of fairly continuous operation and correspondingly higher energy output. As will be noted from the accompanying illustrations the building structure is compact in plan and low in height, resulting in a saving of about $150,000 as compared to the cost of a totally enclosed station building of similar substantial construction but of fully housed design. Operators in both boiler and turbine rooms are fully protected from inclement weather during normal operation and principal maintenance is carried on at seasons when moderate temperatures prevail.

In order to keep the turbine room to minimum height, provision is made to handle heavy turbine parts through hatches in the roof by means of a gantry crane which straddles the turbine end of the station. In summer these hatches may be used to afford additional ventilation and contribute to comfort of operators. Neatly kept grounds contribute to the generally pleasing appearance the station presents, in which respect it conforms to the Olmstead hydro station, 1,000 feet distant, and a group of surrounding buildings, including a "model electric home" used for demonstration purposes.

SINGLE 15,000-kw. General Electric trurbo-generator with direct-connected exciter comprises the station capacity; turbine exhausts into a 16,000-sq.ft. two-pass Worthington condenser



Single Unit

Station includes a single 15,000-kw., 0.8-p.f., 18,750-kva. General Electric turbo-generator with direct-connected exciter, generating at 12,800 volts. Generator output is stepped up to 44 kv. by two 9,375-kva., three-phase transformers located adjacent to the station and then delivered to a 44-kv. bus in the switchyard at Olmsted. Operation of main switches as well as regulation of load can be effected by operators either at Olmsted or at Orem. At Orem duplicate turbine controls are provided and turbine load is normally regulated from the boiler gauge-board by boiler operator, so as to minimize pressure fluctuations and at the same time hold maximum hourly output.

The turbine exhausts into a 16,000-sq.ft. two-pass Worthington condenser served by a single constant-speed, motor-driven circulating pump of 46-cu.ft. per second rated capacity, taking its suction from discharge of Olmsted's hydro units. After passing through the condenser, the water is returned to the canal, from which it is distributed to the surrounding area for irrigation or spilled to river. Gates are provided to control level of water in section of canal where circulating water inlet and discharge are located. In this way partial recirculation of condensing water can be effected at times of minimum stream flow if and when the capacity of Orem station is increased. Inlet water temperatures, range from a maximum of 70 deg. F. in summer to 33 deg. F. minimum in winter.

Fuel supplies for both Orem and Jordan stations are obtained from southern Utah mines in Carbon County. Facilities are provided at Orem to store by dragline up to 7,500 tons of coal, but current supplies are fed by elevator from a track hopper to a concrete silo type bunker of 150 tons capacity discharging by gravity to twin screw conveyors that deliver to stoker hopper. Either of these conveyors will normally handle requirements for full plant output. They are provided with automatic controls for starting and stopping,

so as to maintain constant level of fuel in the stoker hopper. Both the conveyors and gates at bottom of silo bunker are protected from freezing by housing and by steam lines.

A single Combustion Engineering boiler of the three-drum, bent-tube type having 18,600 sq.ft. of heating surface supplies steam to the turbine at 400 lb. pressure, 750 deg. F. temperature; it is rated at 200,000 lb. of steam per hour, continuously.

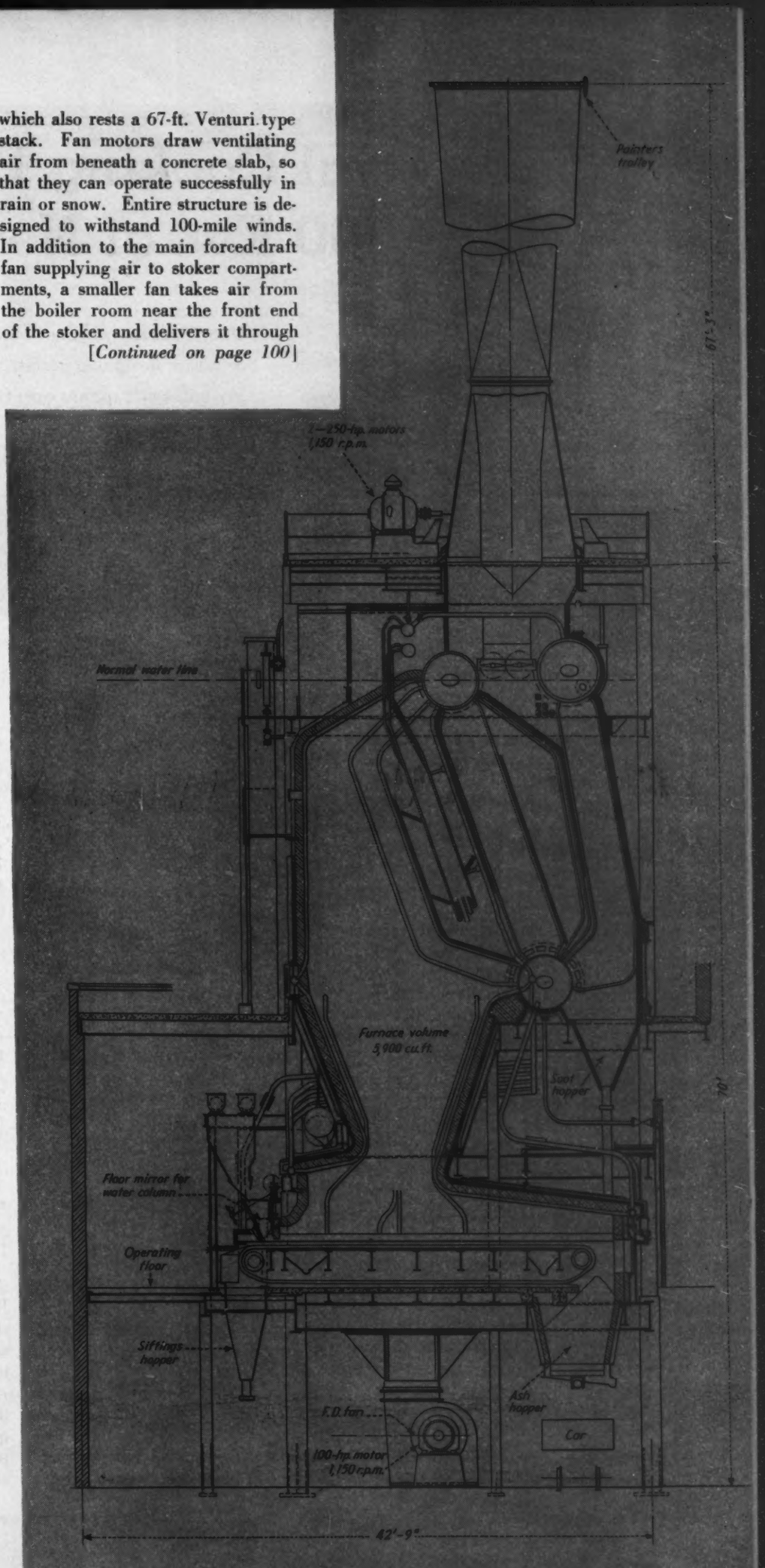
Traveling Grate Stoker

Fuel is burned on a traveling grate stoker 20 ft. wide and having an active length of 21 ft. Screenings 1x0 in. or smaller are used, a representative analysis of which shows 46.5 per cent fixed carbon, 40 per cent volatile matter, 6.5 per cent moisture, 7 per cent ash and 12,600 B.t.u. per lb. Ash-softening temperature averages about 1,900 deg. F. Stokers of this type had not previously been used to burn this Utah coal, but trial of a number of carloads shipped to another plant gave promise of successful results and, since employment of stokers would reduce dust discharge, stoker firing was selected.

As will be noted, only the stoker and lower part of the furnace are below the roof of the boiler room, the entire boiler proper, with its insulated, waterproof steel casing, being out of doors. Water columns and feedwater regulators are inclosed and thus kept in a heated space to prevent freezing, and ducts connecting to boiler room permit reflection of water-level image to operating floor by means of mirrors. Small water-filled instrument piping is imbedded in covering of other pipe lines where exposure would be hazardous. In event of emergency outage of the single boiler in severe weather, salamanders in furnace can keep setting above freezing temperature and electric unit heaters scattered through the station will maintain 40 deg. F. inside with 0 deg. F. outside.

Induced-draft fans driven by totally inclosed motors are located on a concrete slab above the boiler and carried by main boiler columns, on which also rests a 67-ft. Venturi type stack. Fan motors draw ventilating air from beneath a concrete slab, so that they can operate successfully in rain or snow. Entire structure is designed to withstand 100-mile winds. In addition to the main forced-draft fan supplying air to stoker compartments, a smaller fan takes air from the boiler room near the front end of the stoker and delivers it through

[*Continued on page 100*]



SINGLE Combustion Engineering three-drum bent-tube boiler generates 400-lb., 750 deg. F. steam; tubes of front bank and first row in second bank are 3-in. size, rest of second bank and third bank are 2-in. size

Commercial Cooking Program Yields 4,000 Kw. of New Load

Utility accepts responsibility for load development, merges efforts of designing architects, contractors and equipment supply houses—Expands operations in 1940 to develop added load

W. A. TADLOCK, Georgia Power Company, Atlanta

AN ELECTRIC UTILITY serving more than four hundred towns and small cities scattered over an area of 49,000 square miles, with alert natural gas competition in the majority of the larger localities, finds itself confronted with a very real problem in promoting the use of commercial cooking equipment. And yet the revenue-producing value of the commercial cooking load has been proved to such an extent that the compensation will justify an aggressive attack upon the problem.

A widely scattered territory, embracing only a few cities small in size, does not lend itself to economical specialization upon a comprehensive scale. Experience in Atlanta has definitely proved the value of the salesman who specializes on the sale of commercial equipment. But aside from Atlanta and three other localities, there are no other locations with sufficient potential to justify specialty salesmen. Hence, the job of promoting the sale of commercial cooking equipment falls largely upon the shoulders of the salesman who has a multiplicity of other appliances to sell.

Utility Responsibility

Usually the hotel and restaurant equipment houses are interested most in selling heavy-duty equipment. They do not find it profitable to send representatives into the small towns to solicit counter cooking equipment business. So again the promotion and frequently the direct sale of commercial cooking equipment becomes the almost complete responsibility of the utility. Whenever the promotion by the utility creates interest in a large installation by some prospective purchaser, the restaurant equipment house, looking toward securing the sale of the equipment, can then be counted upon to support quite effectively the work of the utility.

W. A. Tadlock

Equipment manufacturers also supplement the promotional efforts of the utility. In the absence of a corps of specialty salesmen, the manufacturers' representatives render invaluable assistance in specifying the proper types of equipment best suited for the job at hand, and further augment the efforts of the utility representatives to sell the advantages of electric equipment over competitive types. This co-ordination of effort renders more effective the preliminary work done by the utility.

Prior to 1939 the commercial cooking and heating business has been obtained without any well-co-ordinated advertising, sales promotion and merchandising program. Periodic activities have been designed to direct special attention to securing this load, and the results of these spasmodic efforts have been encouraging. Limited direct mail advertising programs followed up by the direct sales effort of the non-specialty type of salesman have brought some worth-while new business.

5,880 Kw. of New Load

During the two years 1937 and 1938 a total of 3,170 kw. of new load was added in heavy-duty cooking equipment. In the same period of time 2,710 kw. of new load was secured in counter cooking equipment. This total of 5,880 kw. of new connected load was obtained among 39,000 commercial customers, many of whom are in no sense prospective users of cooking equipment, and in spite of the absence of a year-round sales promotional and merchandising plan.

At the beginning of 1939 it was decided to attempt, upon a limited basis, a specialized effort to increase this business. Early in January a sales training and equipment application school was conducted for certain personnel, best qualified to promote the business. This school qualified a larger group of salespeople to engage effectively in the sale of cooking and heating equip-

*Commercial sales specialist.

IN THIS CAFETERIA 17½ kw. of connected load yields utility a consumption of 24,372 kw.-hr. per year or 1,390 kw.-hr. per kw.

ment than any group previously interested in this phase of the work. Following the training school, the field personnel prepared selected lists of potential prospects for various types of equipment. Direct mail advertising was prepared and sent to this selected market at seasonally opportune times.

It was determined that schools and institutions were particularly good prospective users of new cooking equipment and a plan was designed to direct special effort toward this type of customer. One power sales engineer and one specialty merchandise salesman were assigned to the development of such load. As a result of their work the kitchen equipment in five large institutions has been completely electrified in nine months, with prospects for securing several additional schools. Total commercial cooking and heating load added during 1939 approximated 4,000 kw., which represents a material increase over any previous year.

5 Kw. Appliance Packages

For 1940 our program embodies an expansion of those plans begun in 1939. Again we conducted a training school early in January, devoted principally to counter cooking equipment. Small food service establishments constitute the vast majority of our prospective purchasers. Among this class of customer three pieces of counter equipment, utility grill, toaster and fry kettle, will do a satisfactory cooking job and at the same time they add up to better than 5 kw. of new connected load for the utility. Experience with these appliances usually convinces the customer of their convenience and economy of use and opens the door for the sale of additional equipment, particularly as his business expands.

We will continue the activity already begun on schools and institutions. To this end special assistance and co-operation will be accorded the designing architects and contractors located throughout the territory. A substantial direct mail advertising program will be directed at a larger and better classified group of selected prospects. This advertising will be closely followed up by a more adequately trained and larger group of sales personnel.

Close contact with hotel and restaurant equipment supply houses will be

[*Continued on page 50*]

OVENS, cooking top, ranges, fry-kettle, toaster, steam table and urn heaters totaling 79 kw. are expected to use 7,200 kw.-hr. per month, or 1,090 kw.-hr. per kilowatt

Automatic Zone Substation Has Many Refinements

Pacific Gas & Electric's station F typical of new designs on order of 8,000 kva. for urban service — Vents close in case of fire; new grounding devices utilized

F. S. BENSON, Department of Engineering, Pacific Gas & Electric Co., San Francisco

DISTRIBUTION load at 4 kv. in the area near and adjoining the University of California, Berkeley, is served by two substations, station D, Oakland, and station F, Berkeley. During the last few years the load growth has exceeded the available facilities at these substations. Due to this growth and also the increase of load density in this area, it was necessary to design and construct a zone-type substation near the university campus. This new substation is known as station T and is located on Telegraph Avenue between Blake Street and Dwight Way, Berkeley. It is a non-attended, fully automatic substation and will have an ultimate capacity of 8,000 kva.

Building

The building has a steel frame and concrete foundations, floor and roof. Walls are brick, reinforced to resist earth movements. One side of the building is inclosed by brick walls to form the transformer room. Remaining space in the building is occupied by the switchgear and switchboards. Inside building walls are painted a cream color.

There are no skylights or windows to cause leaks during inclement weather. Two doors are provided, one a service door in the front of the building facing on the street, the other a large roller door in the rear of the building to facilitate installing or removing the equipment. Ventilators are installed in the roof. The two ventilators situated over the transformer room are equipped with fans, which are started and stopped by thermal relays mounted at the ceiling.

BRICK exterior will blend with future modern commercial structures in the neighborhood

Transformer room is provided with large removable panels, bolted to the steel building frame. The panels are made in sections of such weight that they can be readily handled with a small chain block. Louvers are provided in each bottom panel to allow cool air to enter the inside of the transformer room.

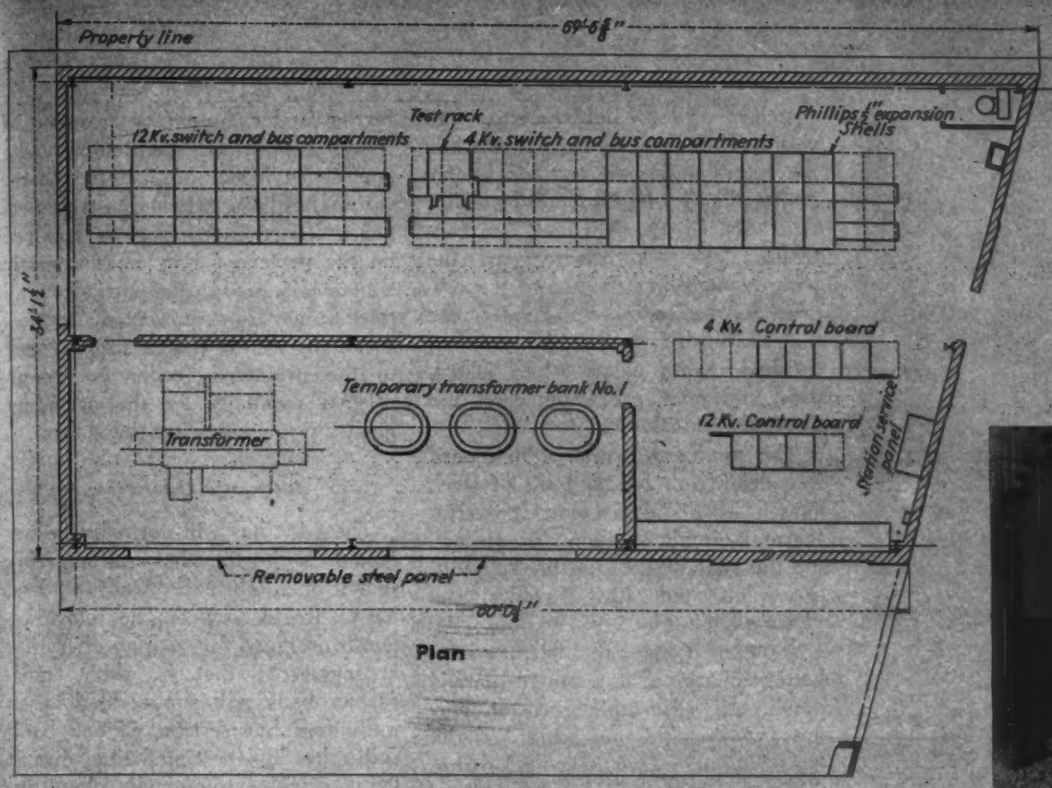
Switchgear

Incoming lines are two 12,000-volt, three-phase, 750,000-circ.mil, three-conductor "compack" strand PILC 15-kv. cables, terminating in the 12-kv. switchgear. This switchgear is metal-clad, lift-up type, completely inclosed; in this structure are a main and transfer bus with suitable disconnects for switching from one bus to the other. One oil circuit breaker having an interrupting duty of 500,000 kva. is provided for each feeder. Current and potential transformers are provided for instruments and relays. All cables are wiped to the bottom of the cells. Two cell positions are used for 12-kv. lines and the other two cell positions are used for the transformer units.

The 4-kv. bus is also metal inclosed. It consists of a main and transfer bus, the main bus being divided into two sections, separated by an oil circuit breaker. A disconnecting switch is used to sectionalize the auxiliary bus. An oil circuit breaker is provided for tying the main and transfer buses together. Suitable disconnecting switches are provided for transferring load between main and transfer buses. Oil circuit breakers are lift-up type, having an interrupting duty of 250,000 kva. All cable connections to the switchgear are wiped into cable terminals provided at the bottom of the switchgear. Two transformer banks and four feeder positions are provided in addition to bus-tie and bus-sectionalizing positions.

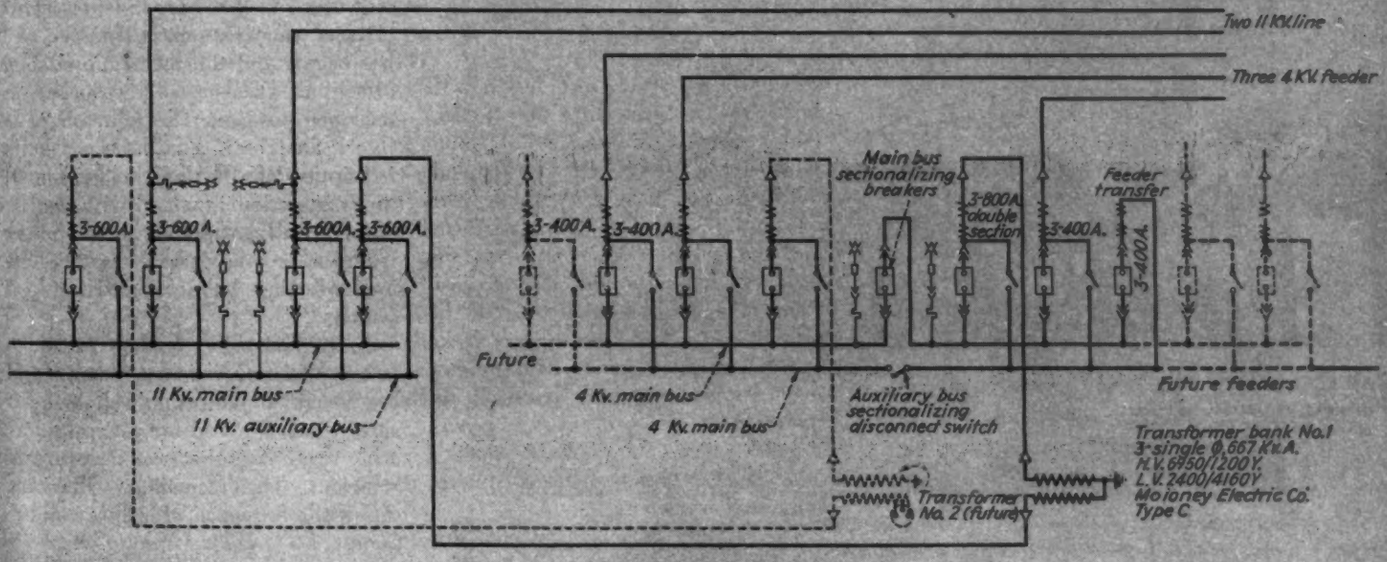
The 4- and 12-kv. switchgear are painted cream color, which gives a good contrast between the panels and equipment mounted thereon.

Switchboard panels are steel. Each is a double unit consisting of a rigid front panel with a door on the rear of the structure. Instruments, control

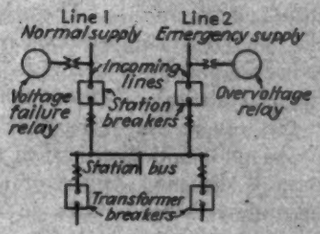


Transformers isolated from bus compartment and control board rooms

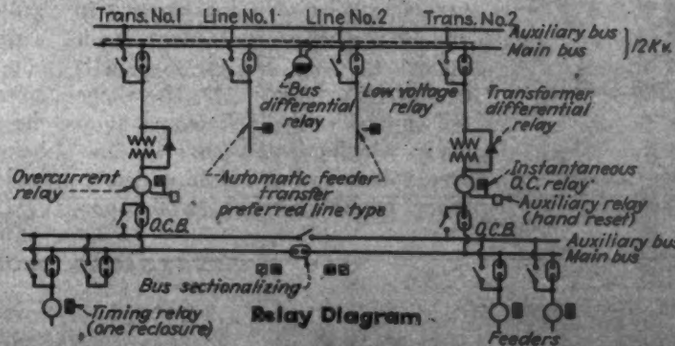
Interior of transformer room. Floor is of crushed rock as a protection in case of fire. Fire also melts fusible links in chains supporting panels in doors, causing panels to drop and shut off air intake

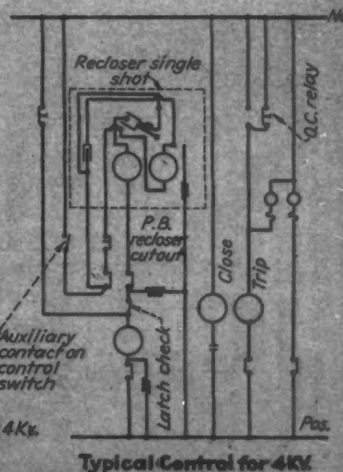


Dual feed with automatic throwover



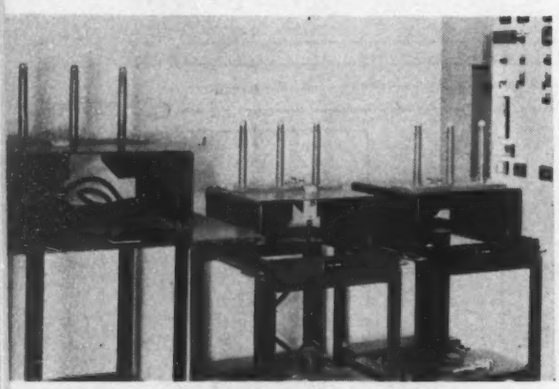
Station has 4-kv. reclosure and is relayed for 11-kv. supply throwover





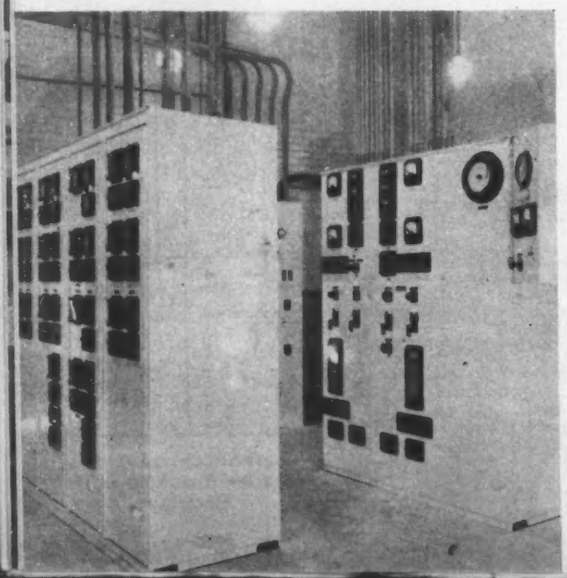
Typical Control for 4 KV. Feeder Breakers with Reclosure

GENERAL VIEW toward back of substation—4-kv. switchgear in right foreground, 12-kv. switchgear in background, 4-kv. switchboard at left



AT LEFT, a 12-kv. switchboard grounding device; at right, two 4-kv. devices

FRONT VIEW of 12-kv. switchboard, rear view of 4-kv. switchboard. Relays are mounted on rear door of 4-kv. board. Station battery in background



switches, pilot lights, etc., are mounted on front of the panel, while the relays and their test blocks are mounted on the rear door. Two switchboards are provided, one controlling the 4-kv. switchgear, the other controlling the 12-kv. switchgear. All instruments and relays are the semi-flush type. Switchboards are finished cream color, while instrument and relay projecting cases are finished in black.

The auxiliary power switchboard is a dead-front board, built of steel, also finished cream color. It carries thermal circuit breakers for protecting the 125-volt d.c. and the 240-volt, three-phase and 240/120-volt, single-phase a.c. circuits.

A 6-amp. Tungar rectifier, used for battery charging, is mounted on this panel. An adjustable rheostat permits varying the magnitude of the charging current, for trickle charging the station battery. The rectifier is so adjusted that the continuous control lamp load is supplied by it.

Transformers

The transformer installation will be two 4,000-kva., three-phase, 12,000-volt delta primary, 2,400/4,330-volt zigzag secondary, self-cooled, outdoor transformers, complete with load-ratio control. These transformers are temporarily installed at the Golden Gate International Exposition. When released they will be transferred to this substation. To take care of the 1940 spring and summer load, a temporary bank has been installed. It consists of three 667-kva., single - phase, 6,950-12,000/2,400-4,330-volt, self-cooled transformers, connected wye-wye.

The 12-kv. bus is protected by bus-differential relays with harmonic-current restraint coils. Transformer banks are protected by transformer-differential relays using harmonic-current restraint coils. The two 12-kv. feeders supply power from station F, Berkeley. One is called the "preferred supply," the other the "emergency supply." An automatic throw-over relay system is designed so that a failure of the preferred line causes its oil circuit breaker to trip and the emergency feeder circuit breaker to close. The relay chain is so interlocked that: (1) If voltage fails on both supply lines, no automatic relaying will occur; if, however, voltage is restored on the emergency feeder and not on the preferred feeder, automatic transfer of power supply will be made to the emergency feeder; (2) if the power supply has been switched to the emergency feeder and voltage is restored on the preferred line, no automatic transfer is made. This prevents an unnecessary interruption of service. Switching of the power supply back to the preferred feeder is accomplished manually by the attendant inspecting or servicing the station.

Automatic Operation

The 4-kv. bus will normally be operated with the bus-sectionalizing switch open when the two 4,000-kva. banks are in service. The relay system is designed for such an operating arrangement; that is, each transformer bank will supply load to an individual bus section. If one bank fails the bus sectionalizing circuit breaker will automatically close, energizing that bus from the transformer bank remaining in service. However, if the bus fails or short circuits, such automatic transfer will not occur, and the bus-sectionalizing oil circuit breaker will be locked in the open position. The relay chain is interlocked, so if a transformer bank is tripped off the line inadvertently, the bus section involved will also be automatically supplied with power from the remaining bank by the closing of the bus-sectionalizing oil switch.

Individual 4-kv. feeders are protected with overcurrent relays and are provided with single-shot reclosure relays. We find for general operating conditions that one reclosure is sufficient. The elementary diagram shows the sequence of relay connections.

General Features

The building steel, transfers, switchgear and switchboards are connected to a ground system consisting of 500,000-circ.mil copper wire, arranged as a ring bus and cross-connected to the equipment so that each piece of apparatus has at least two paths in multiple to ground. Two ground wells are connected to this copper grid. Each consists of a 2-in. copper tube, 12 ft. long, lowered into a well of such depth that the top of the copper tube will be at a level well below the existing water table. This well or hole is then backfilled with

[*Continued on page 101*]

A Capacitor Program for Distribution Betterment*—II

Economic criteria for installations to reduce energy losses — Most profitable application is to postpone plant additions—Capacitor stocks to meet war production loads

THEODORE SEELY and PAUL H. JEYNES, Public Service Electric & Gas Company, Newark, N. J.

IT IS DANGEROUS to generalize on the economic possibilities of reducing copper losses because so many factors are involved—hourly, weekly and annual load cycles and associated power factors, the length and size of conductors, and the energy cost of the loss kilowatt-hours, all are extremely variable.

Perhaps it is simply a coincidence that in the Public Service system certain of these factors seem to offset others, so that a fairly simple family of curves could be developed which provides an index to the potentialities of any circuit. The results are therefore not presented for general application, but to illustrate an approach which in our case has proved most convenient.

First, basic data were obtained from various sources representing characteristic behavior of residential loads, power loads with incidental lighting, and combination loads. Half-hourly records were made of the kva., kw. and r.kva. on typical weekdays, Saturdays, Sundays and holidays, from which annual load curves were prepared for each class. From these annual curves the normal annual losses were computed in terms of the typical week-day peak loss, a calculation similar to determination of annual loss factor.

Proportioning to Circuit Peak

The effect on these losses of adding various amounts of leading reactive capacity, in percentage of the week-day peak load, was then investigated.

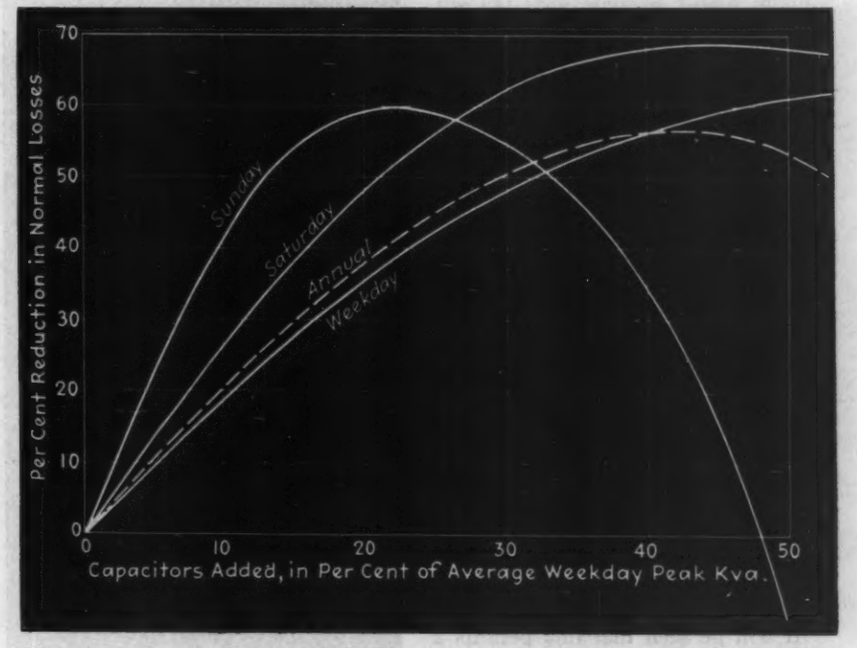


FIG. 1—Results of investigating the amount of capacitor installation for maximum reduction of energy losses on a typical circuit supplying power and incidental lighting loads

Probably this step is familiar; it involves determination of the decreased r.-kva. at half-hourly intervals and the resultant effect on the kva. assuming no change in the kw. The current represented by the new kva. is then squared and summated.

It will be seen (Fig. 1) that the effect of a given small capacitor installation is greater on Sundays, when the loads are lighter and the power factor poorer than on weekdays, but as larger amounts are added a point is soon reached where leading power factors are encountered at times of light load, and the losses begin to increase again.

The curve shapes are of course quite different for the other classes of load, but in general the point of maximum reduction in annual losses always corresponds to a capacitor installation near 40 per cent of the average weekday peak.

Compute Loss Reduction

From such curves it is possible to compute the annual I^2R savings which result from any capacitor installation provided the value of R is known; if the loss value in mills per kw.-hr. is known, the gross annual savings in dollars can be found. A conve-

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nient way of showing this information is given in Fig. 2a. It represents the simultaneous values of circuit peak (average weekday amperes) and resistance (in ohms per phase from substation to capacitor) which will result in a loss reduction just equal to the annual cost of one 180-kva. capacitor bank for various energy costs.

Identical Curves

It was discovered that these curves were practically identical for all of the load curves investigated, so that Fig. 2 applies equally well to all classes of load. Actually the curves are not quite straight lines, though within the limits of usual application they are not far removed, and it is worth while plotting them as such in order to simplify their use.

To illustrate use of the curves, consider the following example:

Which of the following circuits will return the greatest savings from reduced losses if one 180-kva. bank of capacitors is installed?

	Circuit A	Circuit B
Resistance, ohms per phase	0.70	0.35
Average weekday peak, amperes per phase.....	150	250

It is found from Fig. 2 that the cost of the capacitors will be justified by the saving in losses if the cost of losses is:

Circuit A—3.1 mills per kw.-hr.
Circuit B—3.5 mills per kw.-hr.

Of course if the losses are worth more than these values, the savings are even greater. Obviously Circuit A promises larger net savings.

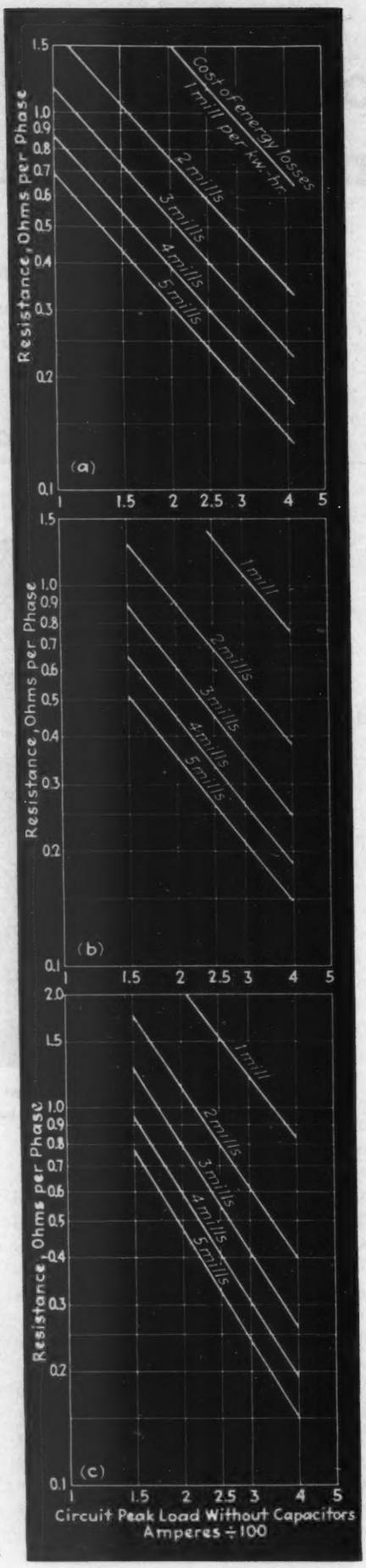
It will be seen that this permits a rapid determination of the preferred circuits, which is the purpose for which it was designed. It also may be used to determine the absolute amount of net savings (*i.e.*, value of annual loss reduction less annual cost of capacitors). To illustrate, using the same data:

Assume losses cost 4.0 mills per kw.-hr.
On Circuit A the capacitors are justified if losses are worth 3.1 mills; if they are actually worth 4 mills, the loss reduction amounts to $\frac{4.0}{3.1} \times$ capacitor cost per year.

Then the net savings = annual cost of one 180-kva. bank $\left(\frac{4.0}{3.1} - 1\right)$.

Similarly, on Circuit B:
Net savings = annual cost of one 180-kva. bank $\left(\frac{4.0}{3.5} - 1\right)$.

The most profitable use of shunt capacitors is usually for postponement of plant additions. This has been the experience in the Public Service system, substation equipment being most susceptible to such postponement. It is most important to understand that such application results in only temporary postponement of the ultimate expenditure.



Improvement Has Limits

By the addition of shunt capacitors, and the consequent improvement of power factor, load growth may be accommodated on equipment already fully loaded without increasing the kva. load on the equipment. But after improvement of power factor to unity, effected by additional shunt capacitor installations, no further load growth can be tolerated and the additional plant can be no longer postponed.

Evidently, as the power factor of load plus capacitors approaches unity, the capacitance required for each increment of additional load become entirely disproportionate, so that the most economic point for provision of the additional facilities may be reached prior to complete power-factor correction.

When economic considerations as outlined above finally dictate the installation of the additional facilities, justification for continuation of the capacitors generally ceases. They may continue to effect some loss reduction or voltage improvement, but unless such continued use is economic the capacitors must be reinstalled at some other location where similar postponement of plant can be accomplished in order to realize maximum return on the capacitor investment. The labor cost of installation is only about 3 per cent of the total capital cost of the shunt capacitors, so that no serious penalty accompanies such a program.

Mobility of Capacitors Advantageous

In at least one case in our experience it was possible to compound savings of this kind by taking advantage of the mobility of pole-type units. Early in 1937 it became ap-

FIG. 2—Justification of capacitors solely by reduced primary copper losses—(a) One 180-kva. bank. (b) Two 180-kva. banks. (c) Three 180-kva. banks

parent that growing loads would shortly exceed the capacity of South Paterson substation. Extension of the substation would have been relatively expensive, resulting in additional carrying charges of about $5,000 per year. A capacitor installation of 720 kva. was then believed sufficient to keep the forecast 1937 loads within the capacity of the substation, and it was estimated that slightly larger additional installations in four successive years would likewise be found economic as the loads grew. Accordingly, 720 kva. was installed in four 180-kva. banks on as many distribution circuits.

But soon after the 1937 peak this area suffered a bad attack of business recession, from which it has not yet fully recovered. The capacitors have been removed to other locations

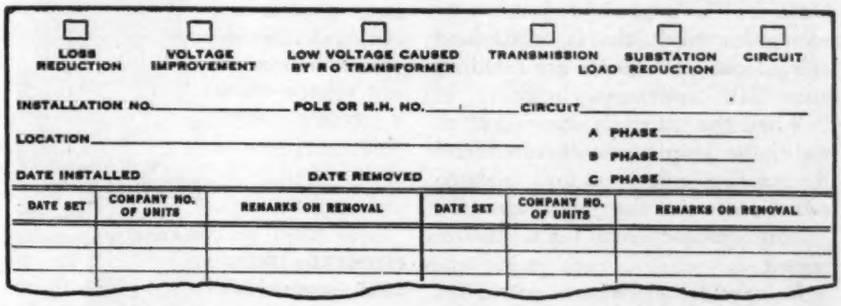


FIG. 3—RECORD CARDS show purpose and details of each capacitor installation

where the savings justify their cost; in addition, we are continuing to enjoy savings at South Paterson of $5,000 per year, representing the carrying charges on the permanent plant facilities which have been effectively postponed to date by the temporary use of the capacitor units.

Be Sure Savings Are Provable

A word of caution with respect to estimating these savings from deferred plant investment is in order. We often read of "savings from released capacity" credited to capacitors, meaning the prorated dollars per kva. of increased system capacity which results from the improved power factor. Unless we can demonstrate that *without* capacitors we would actually spend money for specific plant which will not be spent *with* capacitors, the value of this "released capacity" is probably zero. For this reason it appears safer to evaluate only the specific postponements that are demonstrable, rather than to evaluate the reduction in kva. at a unit cost which is typical for all the facilities whose load is affected. Many an ill-advised power-factor bonus clause in power rates could have been avoided by careful thought on this subject. When capacitors are owned and operated by the utility installations can be limited to those temporary locations where real savings will justify them; at the same time, the annual cost of the units is not increased by that margin which is required in a bonus sufficient to induce customer ownership.

Another common source of over-optimistic estimate deserves mention. It is an obvious error, but one that frequently appears in technical literature. It consists in totalizing savings that are not really cumulative; for example, annual savings from a postponed feeder are added to the savings in copper losses on the original feeder. Obviously these are not additive; the proper comparison is:

A. With Capacitors
- (1) Annual cost of capacitors.
- (2) Annual cost of the losses in the original circuit with capacitors added.

B. Without Capacitors
- (1) Annual cost of new circuit.
- (2) Annual cost of losses in new circuit.
- (3) Annual cost of losses in original circuit under new loading, without capacitors.

Preparation for War Loads

Advance purchase of capacitors merits consideration in preparation for war loads, which may be firmly anticipated, but quite unpredictable as to location, duration or amount. Many such demands can be accommodated quickly and economically as they materialize by means of capacitors, assuming that the units are available. In addition to insuring their availability, advance purchase of the units permits recovery of at least part of their carrying charges in the form of reduced copper losses by making temporary installations of the units on distribution circuits as they are received rather than by holding in the storeroom until needed for load reduction.

Cost Recovery

It will probably be found in most systems that comparatively few circuits promise to recover the full cost of capacitors in the shape of reduced losses, but a number may return half their carrying charges. If we estimate annual carrying charges at 12 per cent of the first cost. then half the carrying charges would amount to ½ per cent per month, or 3 per cent in six months. As remarked above, the labor cost of installation amounts to the same 3 per cent of the first cost, which expense would not have been incurred if the temporary installation were not made.

Obviously, if the capacitors are placed on the lines for six months, during which time they recover half of their carrying charges for that period, the savings will just equal the labor cost of installation, so that the venture will break even as compared with keeping the units inactive in stock. If the units are applied to a circuit where the saving in losses just equals the carrying charges, the installation expense will be written off in three months, and so on.

It will appear that optimum utilization of the capacitor investment requires continual investigation of preferred temporary locations. In order to facilitate such a program equipment record cards are maintained which show the number and location of units on each circuit, together with a notation of the purpose for which the installation was made—loss reduction, circuit load reduction, substation load reduction, or voltage improvement. Should loads materialize suddenly which require removal and reinstallation of units, this record provides an index to the availability of equipment which is in marginally economic service and which can be released for more profitable applications without notice, or equipment which can be transferred without notice to another circuit provided it is fed from the same substation.

Grounded Cutouts Improve Street-Lighting Service

Service is restored to accidentally grounded loop by removing known ground connection at cutout—Fault ground is then traced and cleared

W. H. McKINLEY, Superintendent Division of Electricity, City of San Diego, Calif.

BY PROVIDING a known ground on its series street-lighting circuits and by situating this ground so that it can be disconnected, if necessary, the city of San Diego has eliminated the difficulty of having lights out of service by reason of two unlocated ground faults occurring on the circuit.

Under this system lights go out of service when the first ground fault occurs. The fact that a fault has occurred is thus known and service is temporarily restored by a patrolman, who simply disconnects the known ground. The circuit then operates through the fault until the next morning, when the fault can be readily located.

Automatic Cutouts

This scheme is made feasible by the use of automatic cutouts on the secondary, so designed that it is possible to disconnect service from the loop and short out the secondary of the transformer while the circuit is operating. The San Diego system is using Matthews "Serieswitches" for this purpose and is pursuing a systematic program of installing such units on each circuit.

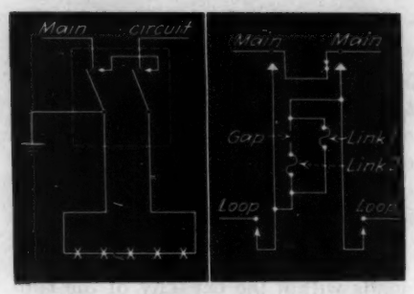
The cutouts are conveniently located, either on a pole or, in the case of underground, on a pedestal standing between sidewalk and curb. The inclosure on the pole is weatherproof, of sheet metal. It was designed by the city and built in the city's shops. The pedestal inclosures are of cast iron, made in a local foundry according to the city's specifications.

The view of the inclosure with door open shows cutouts for two loops. Main circuit connections are at the top, loop connections at the bottom. The ground jumper can be seen at lower left; that is, on the load side of cutout. Cutouts are rated 7½ amp., 5,000 volts open circuit.

When the cutout is opened, as at right, the loop is disconnected and the main secondary (at top) is shorted closed. In this view also the ground jumper has been disconnected.

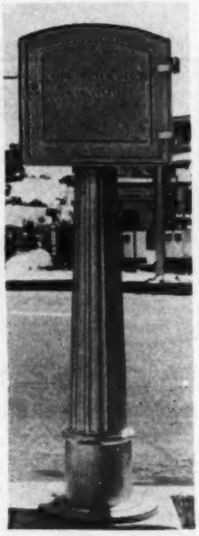
In operation, when a patrolman notices that part of a circuit is dead on a particular night, he notes on his patrol sheet which part of the circuit is out and the approximate location of the ground. He also notes any evidence of ground work or other disturbances which may have caused the ground fault. He then goes to the cutout, opens it and clips the ground jumper. Then he closes the cutout and the entire circuit burns for the remainder of the night. The next day the repair crew removes the ground fault and restores the known ground.

The use of cutouts on the San Diego system is made especially desirable by reason of the fact that current is purchased on a flat rate. Without cutouts it is necessary to call upon the utility to send a trouble crew to pull the primary plugs at the transformer station in order to de-energize the circuit for repairs. A second trip is necessary for re-energizing. As crews are not always immediately available, delays sometimes occurred, leading to losses both by reason of outage and delay for the city's crews. Under the new system the repair crew de-energizes the circuit by opening the cutout. The cutout door is removable (the door carries the link) and thus serves as a safety precaution, forestalling accidental closing of the circuit by someone else.



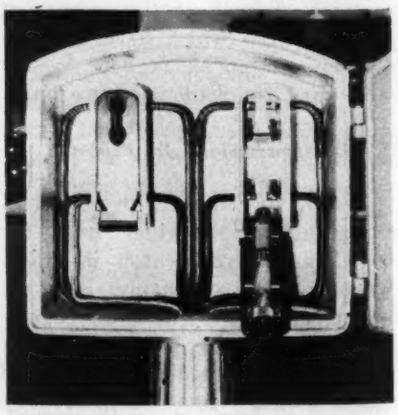
SCHEME of cutout connections showing location of ground (left) and wiring within cutout (right).

When loop is closed onto main line contact between mains opens. Link 1 is a stainless steel wire which burns out on this closing operation, its purpose being to prevent arcing at contact. Burning of link 1 leaves the circuit susceptible to shunting through gap and link 2. When open circuit on loop occurs gap arcs, and link 2 burns, causing cutout mechanically to disconnect loop and reclose contact between mains.



UNDERGROUND is handled by means of a pedestal inclosure, which places the cutouts in a location which is quickly accessible

PEDESTAL INCLOSURE accommodating two cutouts, main circuit connections at top, loop connections at bottom, ground connection at lower left



Cleaning Generators for Improved Cooling

Canadian companies having 209 machines report to Canadian Electrical Association on the frequency and methods of removing accumulations in windings

GOOD cross-section of the practices of Canadian utilities as to cleaning their alternators is afforded by a recent report of the electrical equipment committee of the Canadian Electrical Association. Details were assembled from eighteen companies with 209 generators, of which 161 are vertical and 48 horizontal machines. They range in size from 300 to 50,000 kva. and in voltage from 2,200 to 13,800 volts. Practically half are self-ventilating open type; 53 have lower-controlled air ducts and 30 have forced-draft circulation by means of motor-driven fans; thirteen have equipment for cleaning, cooling and filtering the air; four are totally inclosed and have rotor fan-blades for propelling the cooling air. One machine has a completely closed air circulating system which uses river water as the cooling medium.

Wedges are oiled hard maple in 120 machines, hard fiber in 39, pressed composition in eighteen, micarta in sixteen, formite in two and bakelite in one. Of the 209 machines 96 have wedges chamfered at the ducts and 101 not chamfered.

Cleaning Procedure

Generators are cleaned at scheduled intervals by fifteen of the eighteen companies and these have 170 of the 209 machines. The maximum period of definite schedule is four years and the minimum one week. Three companies (54 units) allow three months or less between cleaning, six (with 69 units) allow six months and five (with 21 units) allow one year.

Of the total of 209 generators, 155 are cleaned by dismantling the unit, scrubbing pole pieces, etc., with stiff bristle brushes, then blowing out the accumulated debris by means of compressed air. Of these, 33 units are cleaned using a solvent along with the brushing operation. Naphtha, gasoline, coal oil and varnish remover are the materials used as solvents.

Twenty-five are cleaned using rifle brushes and air; no complete dismantling as above.

Six are cleaned by means of a thorough going-over with compressed air. No brushing or scraping is done in these cases.

Seven are cleaned by means of a vacuum suction; four of these units are of the totally inclosed type and run at 30 per cent overspeed during the cleaning. These four and two others obtain vacuum by means of a connection to the turbine head cover.

A company having units up to 46,000 kva. (rotor diameters up to 33 ft. 6 in.) proceeds as follows:

First, air intake openings in generator piers at turbine floor elevation are sealed off. Through one of these sealed openings is placed the suction pipe of a 30-in. Sirocco fan, type 5HS, driven at 900 r.p.m. by a 3-hp. motor. This fan is started and discharges outside the power house. All louvers are removed from the generator frame.

By use of brushes and, if necessary, scrapers, all excess accumulation of dust and dirt is removed from the inside and outside of all parts of the machine and carried outside the power house in receptacles.

Next, we go to work with three air hoses and blow out the air passages in a direction opposite to the path taken by the air when the machine is operating. We start by blowing through the stator iron ventilating ducts from the outside of the generator. The air hoses are then taken inside the machine and played on all parts, driving the dust downward between the poles to the turbine pit, from which the air is drawn by the suction fan. Any oil films on bearing housings or oil pipes are cleaned up with rags. Coil ends are blown off to the outsides of the generator.

In terms of generators, 25 involve no limit of air pressure for the cleaning operation, 29 limit to 100 lb. (eighteen of these further limited to 40 lb. on coil surfaces) and the others (108) use pressures of from 10 to 90 lb. Six using suction use from 3 to 10 in. vacuum. Five companies advocate reduction of air pressure for older machines.

Gain in Temperature

Decrease in operating temperature of copper of from 2 to 10 deg. C. (average about 6 deg.) was reported for 58 machines after cleaning, but 25 showed as high as 15 deg. C. decrease in temperature. No change due to cleaning was reported for 27 machines and no tests or records were reported for 75 of the 209 machines.

Slight decrease in iron temperature was reported for 47 machines, but no change for ten after cleaning. No iron temperature records before and after cleaning were reported for 125 machines.

Improvements in the cooling of 61 of the 209 machines were reported. In one instance larger discharge ventilators were installed and the straight fan blades replaced by others of a scoop form, with marked benefit in operating temperature. In another instance the air intake was enlarged and a draw-in fan added to boost the effect of the rotor fans; the gain in generator temperature was 30 deg. C.

Air Velocity Increased

One company blocked two out of three of the rotor spoke holes with ⅛-in. steel plates and found that this increased the velocity of air through the vent ducts 25 per cent in the summertime, with the air duct door open, and 13 per cent in winter, with the air duct door partly closed.

One company increased the area of both intake and discharge openings in power house with improved cooling. In this case the intake was enlarged first and no apparent improvement in cooling was noticed. The next summer the discharge vents on the power house cupola were enlarged and marked results were obtained in improved cooling.

Another company conducted a series of tests aimed at disclosing the cause of unduly high temperature on five 6.6-kv. machines of 32,000-36,000 kva. (100-r.p.m., 248-in. rotors). The resulting gain in output was about 3,000 kva. On these machines the end connections are entirely inclosed and the ventilating air passes through the air gap after passing through the end turns and then out through the ducts in the iron. A slight reduction in temperature rise resulted from installing baffles, which consisted of plates completely closing the openings between the rotor spider casting and the fans. In an attempt to bypass some of the surplus air without detracting from the air passed through the iron the upper plates at the top and bottom of the stator were "cracked" open about ½ in. Tests showed that between 60,000 and 70,000 c.f.m. of air was circulating, with an average velocity within 1 per cent of the original value.

Blowing dirt from the ducts with 50-lb. air gave large gains in elimination of low-velocity areas, a 27 per cent increase in average velocity, with improvements as high as 50 per cent in the center of the stacking. Analysis indicates that the gain of 15 deg. in generator temperatures can be allocated and translated into output benefits can be set down as follows:

	Temp. C.	Kva.
Reduction due to addition of rotor baffles	6	1,000
Reduction due to cleaning	14	3,000
Increase due to opening plates	5	1,000
Net reduction in temperature and gain in output	15	3,000

When a later unit of similar rating and construction was installed some of the changes in details were as follows and a much cooler unit was obtained:

(a) The use of 4.4 per cent silicon iron as compared to 2.2 per cent in the original units.

(b) Larger air ducts through the iron.

(c) Forty per cent increase in armature copper.

(d) Transposition of winding at each coil connection.

(e) Larger blowers and more effective sealing around blower shrouds.

(f) Cutting off overhanging edge of wedge in air ducts.

Washed Air

A complete air washing and filtering installation has been made at a plant which has three 15,000-kva. vertical generators running 22-ft. rotors at 85.7 r.p.m.

The fan and washer have a capacity of 180,000 cu.ft. of air per minute, which is discharged into a pressure chamber. From the pressure chamber the air is discharged downward through individual 4-ft. 6-in. square ducts to the pits below the generators.

This provides 60,000 cu.ft. of clean cooled air to each generator under same pressure as developed in the basement of the building by the fan in the washed air plant.

Cooling water from the river is piped to the washer in sufficient quantity to avoid the necessity of recirculating the water in the washer. Washed air to the generator pit is delivered at a temperature within about 2 deg. F. of the temperature of the water in the river, which varies normally from about 40 deg. F. in May to about 60 deg. F. in August.

The washed air plant is operated only during the hot months to keep the generator temperatures low during that period.

The main provision for clean air for generator cooling during the period when the washed air plant is not operating is through filter units placed in openings in the downstream basement wall.

These ventilators are in six banks containing a total of 205 filter units, each 20 in. square having a capacity of from 800 to 1,000 cu.ft. per minute each and having an efficiency of 98 per cent for removal of dust from ordinary air. Above the intakes to the filter banks covers are provided with screened entrances for air to the filters and provision is made for closing off air to the filter banks during cold weather.

During cold weather recirculation of air in the power house building is provided for by provision of 108 filter units located in the power house floor. During the cold weather, if additional air above the capacity of the filter units in the floor is found necessary, some air is admitted through the filters located in the downstream basement wall.

Dissipation of Hot Air

Immediately upstream from each generator is located a duet 4 ft. 6 in. square leading up to the open air, and these are each provided with an outlet for providing warm air to the washed air pressure chamber.

Three revolving ventilators each 4 ft. in diameter with a capacity of about 5,000 cu.ft. per minute each are provided on the roof of the building. Windows with obscure wired glass and ample ventilators are provided in the building walls.

The company expressed the opinion that the generators should be cleaned once every three years, by removing the field, etc., even with the air washing and filtering equipment.

Cooking Program Yields 4,000 Kw. of New Load

[*Continued from page 41*]

maintained and their representatives will be given thorough information and training on rate applications. The assistance and co-operation of equipment manufacturers will be solicited as in the past. Finally, our program will be designed not only to bring about an immediate substantial increase in new commercial cooking and heating load, but also will look forward toward a continued promotion of this type of business for the future.

Retire Old Meters by Plan

Appliance activity has overloaded 5-ampere meters 4 to 1 — Inadequate meters due for replacement when revenue loss compares with the carrying charge on new adequate meter

MARSHALL B. HURD,* Iowa Public Service Company

IT IS A FACT well known to all meter men that the customer's load curve has undergone a marked change within the last few years. Energetic sales activities have placed large numbers of 1,000-watt appliances, such as roasters, irons and ironers, on our lines. The Better Light-Better Sight activity placed 150- to 300-watt lamps in sockets that were formerly filled with 50- and 75-watt lamps. The electric refrigerator, a low-demand appliance in itself, comes on at all hours of the day and night, superimposing its 200 watts or so on the existing lighting loads, or perhaps on the peak resulting from use of a 1,000-watt appliance.

Overloaded Meters

The result is a peak load of 20 amp. and upward for a period of three-quarters of an hour to an hour and a half, and in all too many cases it passes through an obsolete type of watt-hour meter of 5 amp. capacity, with an overload curve that droops rapidly past the 100 per cent load point. The answer, of course, is the modern meter of 15 amp. rating, with straight line accuracy to 400 per cent load, but what of the thousands of obsolete meters with which all operating companies are overstocked?

The magnitude of the question is illustrated by some data accumulated from a recent inventory of meters on the system of the Iowa Public Service Company. The total number of meters in service was 64,152. Of this number 48,054, or 75 per cent, were 5-amp., 115-volt meters.

A further analysis was made to break down these 5-amp. meters into four age groups, as follows:

Group No. 1—Meters built previous to 1914. This group is characterized by irregular terminal arrangements, such as top or side connected, three-terminal, two-wire, etc.

Group No. 2—Meters built from 1914-1926. This group has standard terminal arrangements, improved adjustments and somewhat improved overload characteristics.

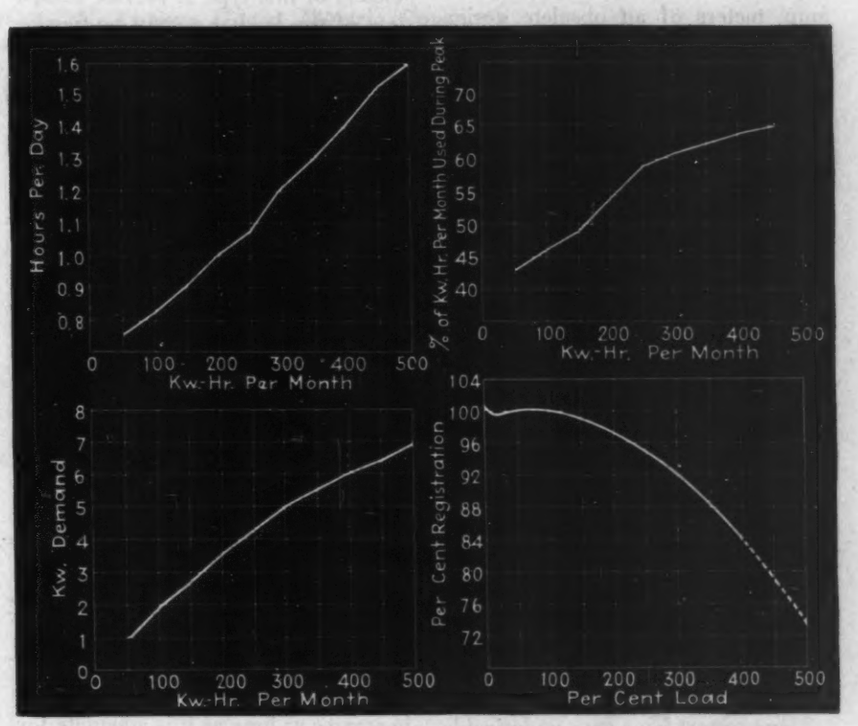
Group No. 3—Meters built from 1926-1934. This group is temperature compensated and has good accuracy to 300 per cent load.

Group No. 4—Meters built since 1934 and including all modern, long-range types.

Subdivision of our 5-amp. meters into these four groups reveals the following totals:

	Total No.	% of Total 5 Amp.	% of Total on System
Group No. 1.....	7,005	14.6	10.9
Group No. 2.....	32,397	67.4	50.5
Group No. 3.....	3,959	8.2	6.2
Group No. 4.....	4,693	9.8	7.3
Total	48,054	100.0	74.9

From a study of the above analysis it will be seen that 82 per cent of all the 5-amp. meters on the system are of a type manufactured before 1926 and are, therefore, unsuited to metering of present-day loads. Moreover, 67.4 per cent of all the



NEW LOAD and old meter

At upper left is shown hours use of maximum demand per day, and at left, below demand curve, for residential service. Per cent of monthly kilowatt-hours used during peaks in residential service appears at upper right. At lower right a typical load curve of a meter in 1914-1926 group.

* Paper presented at recent meeting of Missouri Valley Electric Association.

5-amp. meters are in the group manufactured between 1914 and 1926.

These data, while they apply only to one operating system, are probably representative of a majority of the operating companies, and this fact is easily understood when the history of the development of the industry is considered. Due to the aggressive promotion of the use of load-building appliances, the number of customers who use 100 kw.-hr. per month and upward has been ever increasing, and it has been necessary to buy more and more higher capacity, modern meters, while our meter departments are overstocked with 5-amp. meters of an obsolete design. If these old meters are continued in service, we are going to have to put up with a considerable loss of revenue due to under-registration or else be faced with wholesale retirement of them at some future date. In view of this whole situation there appears to be economic justification for a meter retirement program which would provide for retiring all 5-amp. meters of obsolete design within the next several years.

Plan for Each Group

Beginning with the Group No. 1 meters, those built previous to 1914, it must be remembered first of all that the newest of these meters is 26 years old. Even at most conservative rates of depreciation these meters are now fully depreciated and represent no book value in the fixed capital account.

These meters have very undesirable overload characteristics, a majority of them are of a design for which repairs are no longer available, and many of them have irregular terminal arrangements or positions making them difficult to interchange with later designs. In general, high-potential coil losses and the necessity for more frequent tests to insure accuracy on a meter this old, coupled with the under-registration of even small amounts of energy, make the annual cost of keeping such a meter in service equal to, or greater than, the annual carrying charges on a new meter.

Meters in this first group do not present much of a problem due to their small number. As in the case cited, they represent less than 11 per cent of the total meters and should be removed from service and junked as rapidly as finances will permit.

Coming now to the Group No. 2 meters, those built between 1914 and 1926, it is apparent that these meters are the problem child of the meter department, as they represent some 50 per cent of all the meters in use, yet are obsolete in comparison with meters of present manufacture. It is for this group of meters that a retirement program is most essential.

To Avoid Under-Registration

It is taken for granted that no operating company wants to continue meters of this type in service regardless of the load that may be passing through them. To do so is to invite a substantial loss in revenue through under-registration. If we wish to avoid such a situation we must follow one of three courses.

First, we may use old meters on loads to which they are suited. In many cases more old meters will be found available than can be used, leaving a retirement problem still with us.

Second, we might retire this entire group of meters. This would be an ideal solution, but is obviously impractical due to the large number involved. Moreover, there is no point in putting a modern meter on a minimum customer for whom these Group No. 2 meters are satisfactory.

A third course which might be followed permits the adequacy and condition of the meter to determine the time when it should be retired. In other words, continue the meter in service as long as it is adequate for the load connected to it, and it requires no expenditure for maintenance; retire it when it becomes inadequate or is in need of repair.

This principle appears economically justified when some of the facts concerning meters of this group are considered. These meters have overload characteristics which are somewhat of an improvement over their predecessors and will carry 180 to 200 per cent load without registering more than 2 per cent slow. This represents a wattage of from 1,035 to 1,150, and there are a great many customers whose peak load never reaches this figure, nor will it for several years to come. For the small consumer in this class, probably using not in excess of 30 or 40 kw.-hr. per month at the most, these Group No. 2 meters are as satisfactory as a modern meter and nothing is to be gained by replacing them.

As to repairs on meters of this group, there is usually more justification for junking them than for spending any money on them for repairs. It must be remembered that these meters range from 15 to 25 years in age, the weighted average probably being somewhat around 18 years. Assuming a depreciation rate of 5 per cent per year, which is conservative enough to meet the approval of most rate-making bodies, these meters now have a book value ranging from none up to $2.25, based on an original cost in place of $8.50. It is apparent at once that the cost of repairing, cleaning and repainting such a meter can easily exceed the value of the meter itself.

Retired When Inadequate

It has previously been stated that a meter should be retired when it becomes inadequate. As an example of this condition let us assume a 5-amp. meter installed on the premises of a customer whose consumption has increased to an average of 75 kw.-hr. per month. It is found that an average registration of 75 kw.-hr. per month through this particular make and type of meter will result in an under-registration of 5 kw.-hr. per month or 60 kw.-hr. per year. We will assume that these kilowatt-hours, if registered, would be billed at the 3-cent step in the rate. The loss of revenue due to under-registration is, therefore, $1.80 annually.

The cost of a modern 15-amp. meter is around $7.75 and represents an investment of about $8.50 after being badged and tested. Annual charges on this meter will include:

Interest	6.0 per cent
Depreciation	5.0 per cent
Taxes	1.1 per cent
Total	12.1 per cent

The annual charges on a new meter are then $8.50×0.121=$1.03. The value of revenue lost due to under-registration is $1.80, which, capitalized at 12.1 per cent, is $14.90. Making the reasonable assumption that the new meter will record all the kilowatt-hours consumed, it will be seen that the increased revenue is 1.75 times that required to carry the increased fixed charges due to purchase of the new meter.

Therefore, from a standpoint of

[*Continued on page 102*]

Customer Service Program Works Out for Kansas G. & E.

Improved customer relations and increased usage result from personal interviews by trained utility personnel — First year's operation shows two dollars return in sales for every dollar of cost of program

PUBLIC RELATIONS SERIES

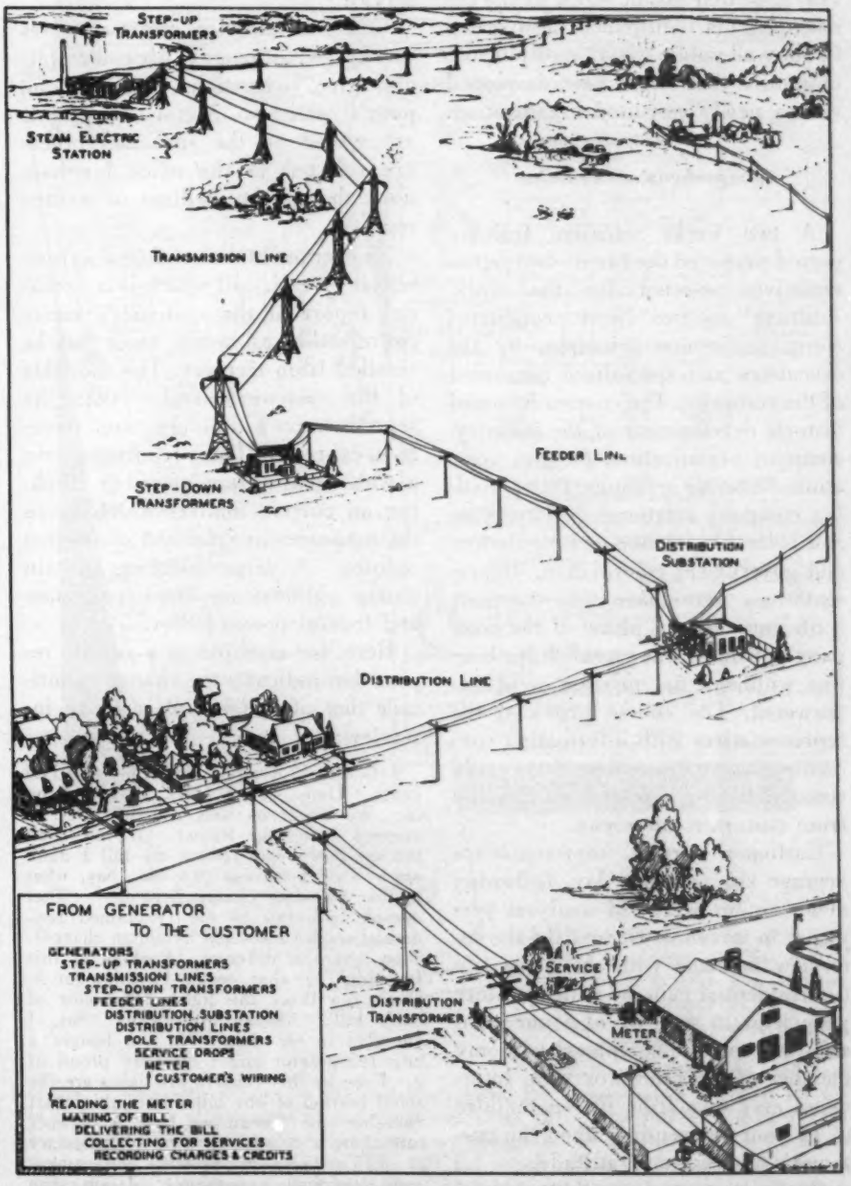
H. W. HOBSON, Kansas Gas & Electric Company

FIELD CHECKS after a year's experience with our customer service program have shown that this work not only has increased the use of our service by the 22,000 customers called on but also has cleared up many misunderstandings that previously have caused the majority of customer complaints. Spot checks indicate average annual kilowatt-hour increases of 8.2 per cent among residential customers called on and in one geographical division of our company the number of complaints has decreased by two-thirds since this work began.

The plan was begun in April last year, its purpose being "to create and foster a better understanding between the company and its customers, thus enabling the company better to render a more comprehensive and wholly satisfactory service" by:

1. Discovering and clearing up misunderstanding.
2. Answering customers' questions and giving out accurate information relative to the company, its policies, operations and rates.
3. Being of immediate actual service to the customer.
4. Collecting, analyzing and bringing official attention to customers' needs, complaints and suggestions from the viewpoint of the customer.
5. Offering helpful and accurate information relative to any subject pertaining to the company's business or service in which the customer may be interested.

The program contemplates a personal call on every one of our 63,000-odd residential and commercial customers by specially trained employees. The customer service representative, as he is called, is not permitted to sell merchandise, although the company is engaged in appliance selling to a limited degree. His function



THIS CHART, one of several in customer service representative's field manual, enables him to illustrate equipment and investment necessary to serve the utility customer

is to analyze the customer's use of electric service, breaking down his bill to show the monthly and daily costs of the various types of service and to assist the customer in getting the greatest possible benefit from the money he spends for electric service.

Personnel for this work was carefully selected from within the ranks of the company. Principal requisites are a good personality for public contact duties and the ability to present effectively the company's message and to secure friendly consideration. Because of the nature of the work only male employees were selected. A minimum of two years experience with the company is required in order that the representative will have a first-hand knowledge of the company and the organization and will fully comprehend the scope of the endeavor. This requirement also serves to allay all public question of purpose or motive that might have developed with a newly recruited organization.

Comprehensive Training

A two weeks intensive training period prepared the twenty-two representatives selected for the work. Training courses were conducted along conference principles by the executives and specialized personnel of the company. The courses included historic development of the industry, company organization, finance, operation, customer relations, taxes, holding company relationship, city, state and federal legislation and regulation, and government competition. Representatives were taken into complete confidence. Every phase of the company's business was revealed. Nothing was withheld, no question went unanswered. The course provided the representatives with information concerning every question that could reasonably be expected to develop from customer interviews.

Customer service representatives average six calls per day, following meter routes with bill analyses prepared in advance. Ordinarily the interview is made with the housewife for residential calls or with the store proprietor in the case of commercial calls, but may be completed with any member of the family or firm. Interviews may take from fifteen minutes to 1½ hours, depending upon the customer's interest and attitude.

Our experience shows that much of the success of an interview is dependent upon the approach and the opening remarks of the representative. He is instructed to say he has no merchandise to sell, but is there to be of service to the customer by giving information concerning the customer's service account. This removes the representative from the category of a salesman, canvasser or peddler and gains admittance in virtually all cases. Knowledge of the visit spreads in the neighborhood ahead of the representative, making entrance relatively easy. Ordinarily the contact is completed on one call. However, as no appointments are made for initial calls, some call-backs are necessary for those not at home or for a more appropriate presentation to include other members of the family, or to supply additional information and service.

Customer service representatives encourage customers to air complaints and give suggestions on the company's policies. Minor complaints are settled on the spot and others are referred to the office for handling though the medium of written reports.

The representative makes a written report of each call which is a verbatim report of the customer's entire conversation as nearly as it can be recalled from memory. The thoughts of the customers, rather than the representative's opinions, are, therefore, expressed. These reports contain a wide cross-section of public thinking on current matters which keeps the management informed of current opinion. A large number contain strong opinions on municipal, state and federal power policy.

Here, for example, is a sample report that indicates the change of attitude that often takes place in an interview:

J. G. Blank, Ave. bill, $3.56, per day 11.9 cents. Time: 1¼ hr.—Mrs. B.: Come on in. We might as well get this over (I stopped here four times). If you can't tell me how I can reduce my bill I don't know what good you can do. Say, what is this 60 cents charge here for? That doesn't look fair to me (explained residential service rates and minimum charge). That makes it different. Looking at this I couldn't see that we get anything for it. Don't you think the lights take most of one's bill? (broke bill down) Say, I am glad to see that. We just bought a new refrigerator and I am sure proud of it. I see by this (chart) my lights are the small portion of our bill. Does this chart (another one) mean we have a cheaper rate than a municipal plant? (Summary of FPC—discussed private, government and municipal ownership.) I am sure glad to know this because I would have sure voted for a municipal plant, thinking it would be the better. I think it is fine you are telling your customers the difference between private and government ownership.

Complaints encountered are principally of two classes, the usual "high bill" and some one of several operating complaints, such as voltage, tree trimming, meter reading, radio interference, etc. "High bill complaints" are usually satisfied on the spot as a part of the routine of the call, by breaking down the customer's bill into services and allocating costs to each service used. This evaluation is made with the customer's assistance, creating a consciousness of the numerous uses, often taken for granted, together with the value and cheapness of service. By comparing daily costs with known commodity values such as cigarettes, soft drinks, chewing gum, etc., the customer is brought to a full realization of the advantages and cheapness of service, and frequently sells himself on the value of additional use.

Call-Back on Complaints

Service complaints are the basis of an operating order to the proper operating department for clearance and followed up by a call-back to see that the matter has been handled to the customer's satisfaction. Through this medium of customer complaints we have been able to locate and correct causes of service interruption and customer dissatisfaction that would not otherwise be detected.

The greatest value of the program lies in those intangibles that are most difficult to evaluate—the establishment of a personal friendly contact, the adjustment of a complaint or grievance, real or fancied, the substitution of fact for misinformation, the performance of some minor repair service, an authentic explanation of an act or a policy, and the manifestation of a sincere desire to render the best possible service at the lowest possible cost.

While many of our customers express complete satisfaction with the service and openly praise our company, we have also found and corrected many little instances of suspicion, resentment and distrust of our own operations and utilities generally. Some discourteous treatment or arbitrary or thoughtless action may have engendered a resentment that lies unexpressed and smoldering in

the consciousness of the customer.

Once discussed, these hidden complaints return to their true proportion and a change of attitude becomes apparent. Doubts, suspicion and distrust turn to warm, friendly praise. Out of 17,702 residential interviews, we found 3,562 complaints, real or fancied, or 20 per cent. Of this amount 2,595 (73 per cent) were settled in the field by the customer service representative. Such results indicated on the accompanying report (Form 131) are considered proof that the program is accomplishing its basic objective.

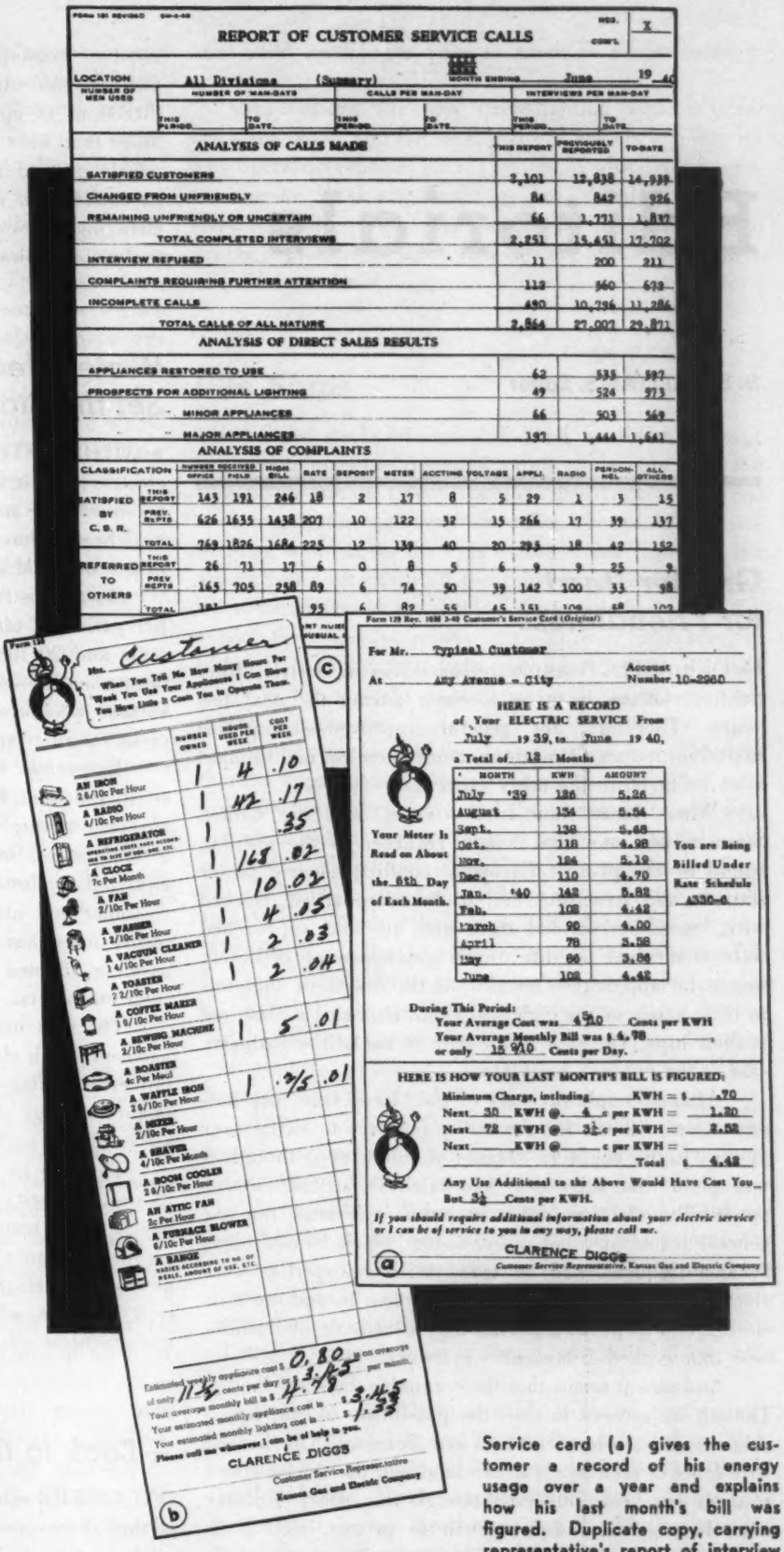
Results on Sales

Further proof of its value is evidenced by the excellent sales results which have developed in connection with the activity. By the bill analysis and evaluation of service the customer is brought to realize the value and cheapness of electric service and consequently increases his use. Customers voluntarily reveal their ambitions and intentions of future use, which is discussed freely with the representative. Discontinued services are restored to use. Load mortality is prevented.

All attempts at dollars and cents appraisal are futile because of the broad scope and the many intangibles involved. However, the sales results alone are sustaining the program at approximately two dollars return per dollar of cost.

This program is helping our company keep pace with modern business management. Our executives feel that it is no longer sufficient to render a satisfactory service at a satisfactory price, but, in addition, the service must be rendered on a friendly basis, on conditions acceptable to its customers.

We have found to our great satisfaction that after the customer service contact there exists a higher esteem and regard for our company; that our service, rates, policies and management are considered most satisfactory. Commendation stands high, criticism is rare. Oustanding also are the numerous compliments paid by the customers to the representative and to the company for the program itself, for the helpfulness of his visit and for his courtesy, and to the company for its foresightedness and thoughtfulness in inaugurating such a service.



REPORT OF CUSTOMER SERVICE CALLS

LOCATION: All Divisions (Summary) — MONTH ENDING: June 19 40

NUMBER OF MEN USED	NUMBER OF MAN-DAYS: THIS PERIOD	NUMBER OF MAN-DAYS: TO DATE	CALLS PER MAN-DAY: THIS PERIOD	CALLS PER MAN-DAY: TO DATE	INTERVIEWS PER MAN-DAY: THIS PERIOD	INTERVIEWS PER MAN-DAY: TO DATE

ANALYSIS OF CALLS MADE	THIS REPORT	PREVIOUSLY REPORTED	TO-DATE
SATISFIED CUSTOMERS	2,101	12,838	14,939
CHANGED FROM UNFRIENDLY	84	842	926
REMAINING UNFRIENDLY OR UNCERTAIN	66	1,771	1,837
TOTAL COMPLETED INTERVIEWS	2,251	15,451	17,702
INTERVIEW REFUSED	11	200	211
COMPLAINTS REQUIRING FURTHER ATTENTION	113	560	673
INCOMPLETE CALLS	490	10,796	11,286
TOTAL CALLS OF ALL NATURE	2,864	27,007	29,871
ANALYSIS OF DIRECT SALES RESULTS			
APPLIANCES RESTORED TO USE	62	535	597
PROSPECTS FOR ADDITIONAL LIGHTING	49	524	573
" MINOR APPLIANCES	66	503	569
" MAJOR APPLIANCES	197	1,444	1,641

ANALYSIS OF COMPLAINTS

CLASSIFICATION		NUMBER RECEIVED: OFFICE	NUMBER RECEIVED: FIELD	HIGH BILL	RATE	DEPOSIT	METER	ACCTING	VOLTAGE	APPLI.	RADIO	PERSONNEL	ALL OTHERS
SATISFIED BY C. S. R.	THIS REPORT	143	191	246	18	2	17	8	5	29	1	3	15
	PREV. RPTS	626	1635	1438	207	10	122	32	15	266	17	39	137
	TOTAL	769	1826	1684	225	12	139	40	20	295	18	42	152
REFERRED TO OTHERS	THIS REPORT	26	71	17	6	0	8	5	6	9	9	25	9
	PREV RPTS	165	705	258	89	6	74	50	39	142	100	33	98
	TOTAL	191			95	6	82	55	45	151	109	58	107

Mrs. Customer — When You Tell Me How Many Hours Per Week You Use Your Appliances I Can Show You How Little It Costs You to Operate Them.

	NUMBER OWNED	HOURS USED PER WEEK	COST PER WEEK
AN IRON 2 6/10c Per Hour	1	4	.10
A RADIO 4/10c Per Hour	1	42	.17
A REFRIGERATOR (VARIOUS COSTS ACCORDING TO SIZE OF UNIT, ETC.)	1	168	.35
A CLOCK 7c Per Month	1	10	.02
A FAN 2/10c Per Hour	1	4	.02
A WASHER 1 2/10c Per Hour	1	4	.05
A VACUUM CLEANER 1 4/10c Per Hour	1	2	.03
A TOASTER 2 2/10c Per Hour	1	2	.04
A COFFEE MAKER 1 6/10c Per Hour			
A SEWING MACHINE 2/10c Per Hour	1	5	.01
A ROASTER 4c Per Meal			
A WAFFLE IRON 2 6/10c Per Hour	1	3/5	.01
A MIXER 2/10c Per Hour			
A SHAVER 4/10c Per Month			
A ROOM COOLER 2 6/10c Per Hour			
AN ATTIC FAN 2c Per Hour			
A FURNACE BLOWER 6/10c Per Hour			
A RANGE (VARIOUS ACCORDING TO NO. OF MEALS, AMOUNT OF USE, ETC.)			

Estimated weekly appliance cost $ 0.80 or an average of only 11½ cents per day or $ 3.45 per month.
Your average monthly bill is $ 4.78
Your estimated monthly appliance cost is ... $ 3.45
Your estimated monthly lighting cost is ... $ 1.33
Please call me whenever I can be of help to you.
CLARENCE DIGGS
Customer Service Representative
Kansas Gas and Electric Company

(b)

Form 139 Rev. 10M 3-40 Customer's Service Card (Original)

For Mr. Typical Customer
At Any Avenue - City — Account Number 10-2960

HERE IS A RECORD of Your ELECTRIC SERVICE From July 19 39, to June 19 40, a Total of 12 Months

MONTH	KWH	AMOUNT
July '39	126	5.26
August	134	5.54
Sept.	138	5.68
Oct.	118	4.98
Nov.	124	5.19
Dec.	110	4.70
Jan. '40	142	5.82
Feb.	102	4.42
March	90	4.00
April	78	3.56
May	86	3.86
June	102	4.42

Your Meter Is Read on About the 8th Day of Each Month.

You are Being Billed Under Rate Schedule A330-6

During This Period:
Your Average Cost was 4.30 Cents per KWH
Your Average Monthly Bill was $ 4.78
or only 15.40 Cents per Day.

HERE IS HOW YOUR LAST MONTH'S BILL IS FIGURED:
Minimum Charge, including KWH = $ .70
Next 30 KWH @ 4 c per KWH = 1.20
Next 72 KWH @ 3½ c per KWH = 2.52
Next KWH @ c per KWH =
Total $ 4.42

Any Use Additional to the Above Would Have Cost You But 3½ Cents per KWH.

If you should require additional information about your electric service or I can be of service to you in any way, please call me.

CLARENCE DIGGS
Customer Service Representative, Kansas Gas and Electric Company

(a)

(c)

Service card (a) gives the customer a record of his energy usage over a year and explains how his last month's bill was figured. Duplicate copy, carrying representative's report of interview and listing of customer's appliances in use, is filed with utility. In the customer's home the representative evaluates his bill in terms of cost of operation of individual appliances (b). Rear side of this card, kept by customer, carries an institutional message—"cheapness" of electricity, etc. Customer service calls are reported daily on Form 131 (c), which includes information on type of call, follow-up procedure, kind of complaint. Similar reports are filed weekly by supervisor.

FORMS like these help the representative clear up high bill complaints

Editorials

S. B. WILLIAMS, *Editor*

Greater Need for Friendliness

IN ONE ASPECT definite retrogression in electric utility public relations is to be foreseen during the next few years. Therefore, for general improvement in this important matter to continue, more attention and thought must be given to the other aspects.

When, more than twenty years ago, the United States mixed into what is now regarded as the opening round of the present European conflict, electric power stations and structures had to be safeguarded. Barbed wire fences surrounded them and all who approached were challenged by determined gentlemen of definitely homicidal appearance because of the sawed-off shotguns in their hands or the eighteen-pound automatics holstered at their hips. The sign at the gate of the utility property said to the public, "Keep Out."

After a couple of years of the "Keep Out" psychology it was difficult for the utility industry to swing over to the "Come Right In" frame of mind, even though it was plain that this open and friendly attitude was a powerfully effective factor in public relations. But the general frame of mind did change; "Open House" days became frequent, and on many utility properties were erected signs inviting the public to come in and see how electricity was produced. This was an attitude of friendliness that evoked friendliness in return.

And now it seems that these amiable days are fading. Though we are not in war, the possibility of war hangs over us and we must look to our defenses. The barbed wire fence is seen again in the land and the armed guard resumes his beat. But even though the utility industry must be vigilant and competent to protect itself from sabotage and spying, and thus of necessity must exclude the public from its properties, let us hope that the "Keep Out" complex will not become so firmly ingrained that it cannot immediately be thrown off when the hard days are past.

In the meantime, so that there may be no impairment of good public relations, it becomes the duty of utility organizations to redouble their efforts in the other directions of approach to the public relations problem. More than ever it is now necessary for employees to be courteous and tactful in dealings with customers, for executives and others in authority to consider the ever-changing states of the public mind and to direct policies and actions toward public understanding and friendliness.

Water Heater Standards Set the Stage for Progress

ANOTHER STEP toward practical standardization of electric water heaters for the residential customer has been taken with the announcement that new standards for twin-unit heaters have been approved by the technical committee of NEMA's Water Heating Section.

As a basis for the new standards, energy of 30 watts per gallon of tank capacity has been selected for upper units and 20 for lower units. The resulting ratios have been rounded out to the nearest standard element size, so that specific unit combinations are now provided for tanks ranging from 30 to 175 gallons capacity.

Executives in charge of utility load building will recall the joint EEI-NEMA report issued in May, 1938, covering testing procedure. Starting with this report as a foundation, utility water-heating policies have been analyzed to classify the steps taken by utilities to merge customer and utility interests, and the broad trends of utility orders have been studied so that such new standards as were adopted would meet the needs of utilities and their customers.

The next move will be up to utility company management. With elements now available in ten wattages, a universal voltage rating of 230-240 volts and normal factory settings of 150 deg. F. on both units, the stage is set for more uniform water heating sales activities.

Through its great influence on local sales allies and its own authority in requisitions to the utility purchasing agent, utility management can advance immeasurably the rapid acceptance of and consistent adherence to these new water heating standards. For it looks as though here is a situation where the utility, the customer and the manufacturer all win, and nobody loses.

A Look to the North

ONE OF THE exhilarating things about electrical practice is that there are usually several good ways of accomplishing any desired objective. Also, as fast as good ways give in to better ones there come new ways to keep progress active. That lends zest to the jobs, but it does, at the same time, raise questions whether there is justification for all the differences between American practice and what is done elsewhere.

Take Canada, for example, and it is a good example because it is nearest to us geographically, technically and temperamentally. Up there they used thermal meters long before we found virtue in them. They use series surge absorbers extensively while we hold to shunt devices. In places they fuse distribution transformers on a loading basis, rather than for fault protection, and claim good results. They apparently followed the European lead on Petersen coils before we got interested. They have been using single-phase switching for years, and now we see merits in that. Meanwhile, of course, they adopt our advances in other directions. However, they find occasion for reopening questions which we consider reasonably well settled—instance their association program of studying the efficacy of preservative treatments for poles. They have their own answer for conductor vibration troubles.

Circumstances are drawing us nearer to Canada in political and economic spheres and it is to be hoped we can parallel that with closer technological interchange and convergence. Out of such closer relationships should come engineering benefits to both neighbors astride that famed unfortified border. One opportunity to trade ideas will be the A.I.E.E. convention scheduled for Toronto next June. However, one will not have to wait ten months for such beneficial reciprocities, because ELECTRICAL WORLD has already been looking into the departures enumerated as typical and we expect to report about them during the coming months. Some of them are sure to stimulate new thinking in these United States and along with it fresh respect for the pioneering they do up north.

Local Pride in New Street Lights

YEARS AGO, when white-way lighting systems were being installed in almost every community that had any civic pride, the turning on of each new system brought forth a local celebration—a parade, speeches, band concert, special newspaper edition. Great crowds were downtown for the event and the public showed pride in the progressiveness of its community. It has been some time since we had any of that, although the need for better street lighting has grown very much.

A few weeks ago we were reminded of those old white-way celebrations upon the appearance of an eight-page special supplement to the local paper of a town of 16,000 people, served by a municipal plant, Independence, Mo. This supplement was devoted entirely to the new street lighting. It looked as though almost every business house in town took a small advertisement. The people of Independence are proud of their new lights and the municipal plant gets the credit.

To some people these celebrations may seem to be affairs of the moment, but to one who knows small town home pride they last a long time. Every visitor, every relative who comes for a stay, is shown the new lights and told what they do for the community. Few things help build local pride quite so much as a new lighting system.

Negotiations for new street-lighting systems also bring the utility and the local political leaders together in a co-operative venture, the net results of which are bound to improve local relationships. This, coupled with the good will that comes from local pride, puts street lighting in a prominent place as a creator and a maintainer of public good will.

Idle Ships

THREE red stacks banded with black around their tops and next to them two others of a dull, depressing gray, the *Normandie* and the *Queen Elizabeth* moored at their piers, as seen from the window of the office where this editorial is being written. As the eyes of the writer lift from the words being set down on the ruled paper the picture of the river framed in the window shows in impressive procession three massive vessels, battle ships or battle cruisers of the U. S. Navy, their light gray paint reflecting almost white in the sunlight as they move out to sea on their minatory occasions.

In the movement of the three warships down the river there is apparent the purpose for which these ships were built. But the *Normandie* and the *Queen Elizabeth* were not built just to rest in idleness at dock. Nor were the many ships that lie at anchor in the broad reach of the Hudson north of the George Washington bridge, all idle like the two giants at their piers, built for such a purpose. For several months the picture through the office window has shown these ships, one or two at a time, plowing discouragedly up the river, their wave-battered sides displaying the flags and names of frightened or conquered nations —Jugoslavia, Finland, Denmark, Norway, Belgium, Netherlands, and others.

This is war and the fear of war—ships of war outward bound and ships of peace seeking the safety of landlocked waters, there to rust in idleness.

In time of war the ships of men's peaceful affairs are forced to lie at idle anchor. The projects of business, the accomplishments of research and invention, the improvements of social conditions, the multitudinous and infinitely various contributions to happier and fuller living, all are restrained from normal functioning like ships held in port.

Possibly, more than possibly perhaps, this country will find itself in war, and sooner than many of us think. But until war comes to us, let us not allow the fear of it to force the ships of our peaceful affairs into idleness like these actual ships in the Hudson and in other harbors and rivers along our coasts. Instead, let us use our figurative ships to the utmost advantage; encourage business, apply the work of inquiring minds, increase industrial productivity, raise the standard of living, so that when and if the dreaded time comes we shall have a better life to defend and better means to defend it.

Don't Hope for It

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

Franklin Roosevelt and Wendell Willkie on the same platform—at the same time—answering each other's arguments on public versus private ownership of the electric industry!

Can you imagine it? Neither can I. But it was a good idea, and would be an even better idea if there were any chance of FDR taking Willkie up on his challenge.

But the facts are that President Roosevelt does not want any part of a debate with Willkie on *any* issue, and the electric power issue least of all. Not only that, but Roosevelt emphatically does not want public ownership made the paramount issue of this campaign, even now that Willkie has given him a fair chance to do it by virtually eliminating so many others.

To be perfectly fair to Roosevelt and his New Deal advisers, it should be admitted that the reason they do not want this sort of debate with Willkie is not that they think the Republican nominee is right. It is just that they have been just a little bit shell shocked whenever they thought of *any* debate with Willkie since that time the then Commonwealth & Southern president polished off Robert H. Jackson in a debate on the New Deal before the Town Hall in New York City.

Too Big a Chance

To appreciate this one must know what the New Dealers in general, and Roosevelt in particular, think of Jackson. Even FDR thinks Jackson is the second best statesman in the world today, and there are a good many New Dealers treasonable enough to think that Jackson is really No. 1. Only, they admit sadly, they are not sure he has enough political sex appeal to get elected. And of course he could not have been nominated for vice-president, much as they prefer him to Wallace, because he, like Roosevelt, comes from New York. If both had come from Delaware, or even Rhode Island, Jackson might have been FDR's running mate, but 47 electoral votes are too many to risk not having counted for one of your candidates!

So when Willkie virtually knocked the No. 1 champion (certainly after FDR himself) of the New Dealers into a cocked hat in a public debate, and on issues not so dissimilar from those to be argued in this campaign, the impression was pretty nearly indelible. Certainly it is still clearly legible. And it says: "Don't let Willkie get you into a debate even if you name the judges. He'll steal 'em from you."

Remember how timid Dave Lilienthal was when Willkie offered to let the SEC itself referee his company's dispute with TVA? And there are New Dealers who think Dave got gyped when Willkie virtually let Lilienthal himself referee the negotiations!

But even if FDR was willing to debate with Willkie on other subjects, he would not debate with him on the public ownership thesis. There are several signs that the New Dealers do not want any more referenda on that subject, particularly in politically strategic locations.

For instance, there is San Francisco. Now in the days of old San Francisco was a heavy Democratic city. It is still counted on for big majorities for the Democratic candidates. The older inhabitants of southern California were heavily Republican, but the more recent comers are much given to the latest "ism" and are utterly unpredictable.

Maybe Not in the Bag

Now California's 22 electoral votes should be "in the bag" for FDR. All forecasters are so conceding them. But stop a minute. Dr. Townsend, the pet leader of the ham-and-eggers, has come out for Willkie! That gives one pause. Moreover, it makes San Francisco important in this picture.

So what?

Well, San Francisco has given a good many indications of getting a little bit fed up on the New Deal's public power ideas. Way back in 1913 Congress appropriated for the Hetch Hetchy project. In that act was a provision that none of the current resulting should ever be handled by a private, capitalistic concern. San Francisco paid no attention to this. It sold the power to the old privately owned power company, took a nice profit on the sale and let the company sell to its citizens. Did this irritate the citizens? By all the precepts of the New Deal it should have. But every time Honest Harold Ickes has tried to force the town to protect itself from the private capitalists the city has voted overwhelmingly against its delivery from the power minions.

The idea seems to prevail in that interesting city that it is better to have the city make a profit by selling this federal power to the company than to have a politically appointed management for a municipal system. This way the profit helps on the taxes. The Ickes way they would have to be taxed for bond interest, and politics just might prevent the public ownership system being the bonanza the New Dealers predict.

Tired of the Subject

It is not important, in this discussion, whether they are right or whether Ickes is right. The point is that they have been hearing the pros and cons of public ownership until they are sick of them, but they keep right on voting on what might be termed the Willkie side.

So—it might be a little dangerous to make public ownership the paramount issue. And those 22 electoral votes of California are on the Roosevelt *must* list.

Perhaps with San Francisco on their minds, the New Dealers are moving heaven and earth to avoid votes on bond issues in the state of Washington, the hope there being for the thirteen public utility districts, Bonneville and the Seattle municipal plant to join in buying out the Puget Sound Power & Light Co. The point is that Public Initiative 139 will be voted on this November. Under it, should it pass, no bond issues may be imposed without a referendum by

[*Continued on page 102*]

NEWS OF THE WEEK

More Rural Revenue, New Uses Needed by Utilities

Empire State Gas and Electric Association told that sound load building program to produce higher farm uses is necessary to justify rural construction — Must explore new uses

The need for more revenue on rural lines and concrete plans to produce more revenue were two major subjects at the Farm Electrical Council meeting of the Empire State Gas and Electric Association held in New York last week.

Through recent years utility thinking has kept abreast of rural electric needs, Ralph P. Wagner, general sales manager New York Power & Light Co., Albany, said and the companies have made every feasible extension, inaugurated attractive rate schedules, and must now increase their efforts to build load. The only way to justify the low rates for rural service was for the companies to push sound load building programs for higher levels of usage.

"We have the product and we have the customer," Mr. Wagner said. "We should sell the customer on the uses now available to him and we should pursue research for new rural uses." In connection with this point Mr. Wagner cited experiments his company is conducting at New York State Agricultural Experiment Station at Geneva to determine possibilities of food freezing cabinets and locker plants.

Night Rate

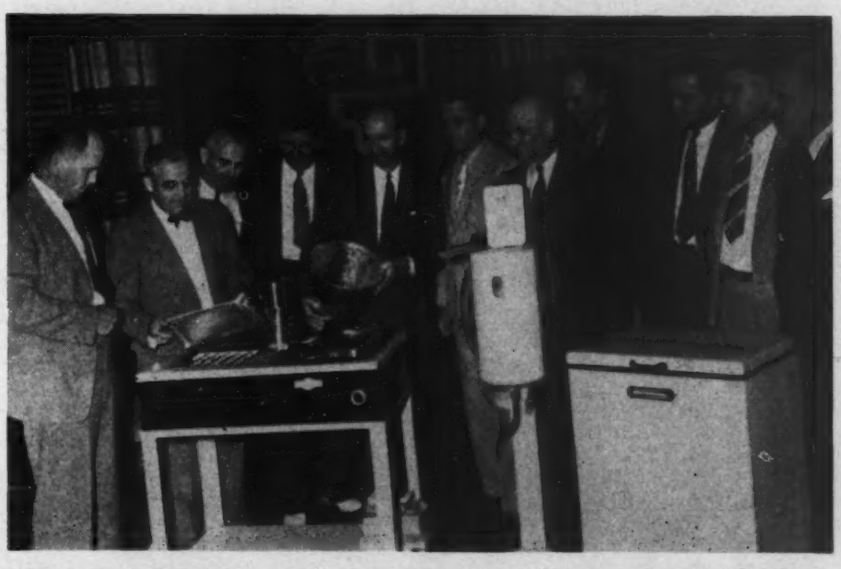
The new night-use rate of New York State Electric & Gas Corp. was designed by C. R. Rudy to get more business, John L. Burgan told the group. While the rate is filed as night-use rate, the bulk of the usage is for water heating. A two-dial meter is set for 10:30 p.m. to 7 a.m. operation on the following rate: First 50 kw.-hr. at 2 cents, all excess 1 cent plus $1.25 per meter per month.

Renewed sales effort on large capacity single-element water heaters is expected to result in the sale of 1,500 heaters this year, Mr. Burgan said. The farmer will get hot water for added uses such as in the dairy; he will get numerous daily uses performed on the 1-cent rate, and it is expected that bulk usage under the 1-cent rate will result in an average system rate of approximately 3 cents.

H. E. Dexter, vice-president Central Hudson Gas & Electric Corp., displayed his all-electric kitchen, available for "three nickels a day." The kitchen consists of a "Mealmaster," lift-top refrigerator and pressure-less water heater. In 1939 Central Hudson sold its added rural kilowatt-hours for approximately 4 cents.

H. S. Pringle, New York State College of Agriculture, outlined methods followed in classes where farm customers are taught how to repair their own appliances and restore them to service, sometimes after three years on the customer's shelf.

Many of the appliances, such as irons, toasters, roasters, curling irons, kitchen units and floor lamps, have been taken to dealers for repairs, customers told Mr. Pringle, but dealers replied that the repairs could not be made and then



RURAL CONFERENCE—Viewing the all-electric kitchen at the Farm Electrical Council meeting of the Empire State Gas and Electric Association meeting in New York last week. L. to r.—R. P. Wagner, New York Power & Light; Harris E. Dexter, Central Hudson Gas & Electric; T. W. Billings, Federation Farm Supplies, Inc.; John L. Burgan, New York State Electric & Gas; R. G. Harvey, Central New York Power; L. D. Kelsey, New York State College of Agriculture; W. W. Carson, West Penn Power; R. F. Bucknam, New York Public Service Commission; H. S. Pringle, New York State College of Agriculture; M. W. Nixon and George H. Smith, Empire State Gas and Electric Association

tried unsuccessfully to sell the customer a new appliance. The classes were started in 1926, when farm women brought in broken appliances. There are plenty of people who will sell appliances to the farmer, Mr. Pringle declared, but very few who will service the appliances.

The disinclination of dealers to assume the responsibility for service was stressed also by L. D. Kelsey of New York State College. Reciting a series of specific cases of desultory efforts by dealers to help on appliance service troubles, Mr. Kelsey said manufacturers and utilities must supervise service facilities or farm sales will provide little repeat business. Dealers make it very clear, he said, that they don't want to be bothered by appliance service calls and when they do respond impose heavy charges.

The expanded rural program of West Penn Power Co. was described by W. W. Carson, who pointed out that rural load building is a long-pull job, requiring modernization of customer habits, and that utility interests should be observed by encouraging the addition of good load-factor loads.

Truman W. Billings of the Co-operative Grange League and H. G. Dooley of ELECTRICAL WORLD were the other speakers. R. G. Harvey of Central New York Power Corp., Syracuse, presided at the sessions.

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Niagara Falls Power Asks Connection with Canada

Niagara Falls Power Co. has filed with the Federal Power Commission for construction, operation, maintenance and connection at the international boundary of facilities for transmission of electric energy from Canada to the United States.

The proposed connection would be on a bridge about to be constructed across the Niagara River, from Niagara Falls, N. Y., to Niagara Falls, Ont. Until 1938 a similar connection existed on the upper steel arch bridge destroyed by ice. The connection would tie in with the transmission lines of Canadian Niagara Power Co., Ltd., principal subsidiary of the applicant.

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Plans Rate Appeal

Safe Harbor Water Power Corp., first hydro-electric company to have its rates reviewed by the Federal Power Commission, will appeal the decision of the commission which fixed a fair return for the company at 6 per cent on its net investment. The company will take what steps it considers appropriate for judicial review of the order.

Heavy Rains in South Fill Hydro Reservoirs

Storm of hurricane velocity caused disruption of utility systems — Hydro plant of Tennessee utility damaged — High waters cause severe property loss and power line washouts

Storms of hurricane velocity swept through the South last week, leaving considerable damage and disruption of utility systems. The heavy rains filled reservoirs and allowed many systems to switch loads from steam to hydro stations. The storm blew in from the sea at Savannah, Ga., traveled up to Charleston, S. C., and then went inland, hitting Tennessee and Virginia. Another storm at the same time hit Louisiana.

At Savannah the 90-mile wind felled trees, which carried down power lines disrupting service. Damage was estimated at about $75,000.

Charleston Damage

The Charleston steam plant of Carolina Power Co. was slightly damaged, but was not shut down. The distribution system was damaged and three crews from Georgia Power Co. were dispatched to aid in restoration of service.

A few of the towers of Virginia Electric & Power were washed out in Roanoke Rapids - Petersburg - Suffolk loop; service was not interrupted. At Roanoke Rapids the water rose to the second story of factories, the highest in fifty years. Electric plants were not damaged as they previously had been protected against such an emergency.

The superstructure of the power house at the Wilbur hydro station of East Tennessee Light & Power Co. on the Watauga River was damaged during the storm. The company plans to restore the 4,500-kva. plant. The steam station on the same river was flooded and out of service for several days. Due to high water the hydro station on the Nolichucky River had to be shut down temporarily. The plant is now back in service.

The Louisiana storm left considerable property damage due to floods. The lines of Gulf States Utilities Co. in Port Arthur suffered damage. Wind blew in the windows of the Lake Side steam station and one of the two 4,000-kw. generators was wet down, causing a flashover. The plant is used as a standby. Some domestic lines were out.

C. I. Burkholder, vice-president of Duke Power Co., reported that the rains on the Catawba watershed have filled all of the storage reservoirs of the company, enabling it to curtail the operation of steam, which has been run for the past several months. The crest of the flood has passed the plants, Mr. Burkholder said, and no damage has resulted to any of the major plants of the company.

Other utilities reported that the heavy rains have filled power reservoirs and there will be no shortage of hydro power.

While the level of the TVA dams, in some instances, is below the summer normal operating level, the rains have put them well above recent marks. The dams are being operated to level off the floodwaters as the crest passes down the Tennessee Valley. There has been no flood damage along the Tennessee, Hiwassee and Clinch rivers below TVA dams, the authority reported.

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SEC Publishes Data on Utility Operations

Vital statistics of 188 operating utilities of registered utility holding companies for the ten-year period 1930-39 inclusive have been compiled by the Securities and Exchange Commission in a 206-page volume now available free of charge from the Public Utilities Division.

The tables show operating revenues, gross income, fixed charges, preferred dividends, common stock dividends, capitalization, surplus, depreciation both as charge to income and as allowed for taxes, dividend arrearages, and similar data for each company. The book is the work of Clarence A. Turner of SEC's utilities division and is the outgrowth of a request made last November by then Commissioner George C. Mathews for this data on all companies with dividend arrearages.

Several companies commented upon the differences in depreciation figures for tax purposes and as charged to income, pointing out that the tax calculations result from arbitrary regulations of the Treasury and have no true relation to property. These comments are printed without interpretation.

It is planned to make the new manual an annual affair and that any errors in the present manual will be noted in the edition of next year.

RFC Offers Aid to PUDs to Buy Utility Facilities

Government funds to be made available to districts seeking properties of Puget Sound Power & Light — Purchase proposal must be sponsored and approved by Bonneville Administrator Raver

Another gigantic public ownership area—a TVA of the Northwest—is envisioned by advocates of public utility districts as a means of securing a market for the tremendous amount of hydro-electric energy from the government's Bonneville and Grand Coulee dams.

Last week the Reconstruction Finance Corporation offered to become the financial angel for Washington State's quarreling PUDs seeking to buy the property of Puget Sound Power & Light Co. However, two important and significant strings were tied to the proposal.

Bonneville Approval

First of these strings is RFC Chairman Emil Schram's requirement that, to get consideration, any purchase proposal must be sponsored and approved by Bonneville Administrator Raver. The second came in Mr. Raver's statement of willingness to act as sponsor if all thirteen of the affected PUDs agree to a single "feasible" plan.

If these conditions should be met, New Dealers will be in a position to repeat, in the Bonneville area, the performance of buying out a private utility to spread the virus of public power operation under government ægis.

Mr. Raver's contemplated procedure calls for organization of a new corporation in which all thirteen PUDs, Bonneville and the Seattle municipal plant would join. This corporation would attempt to close an actual deal, then parcel out the Puget Sound property among the co-operating agencies, Bonneville taking some of the transmission facilities.

Admittedly, however, all this is easier to plan than accomplish. The PUDs have been split into two warring camps, one of which is reportedly tied up with Guy C. Myers and is seeking to close the deal on a commission basis.

Entrance of RFC into the picture is calculated to offer the inducement of eliminating fees and costs of private financing as well as, indirectly at least, help defeat Public Initiative 139 on the November ballot in Washington, which, if passed, would require a referendum before any PUD could issue bonds. PUD commissioners now can issue bonds on their own authority; passage of the initiative would mean that an adverse vote by a single district could upset any RFC-Bonneville-PUD co-operative arrangement.

Mr. Raver, incidentally, went to Washington last week on another mission, to seek further appropriation of government money to speed up the Bonneville program for transmission lines, representing the proposal as in the interest of national defense. He said he is not proposing any extension of the Bonneville program; merely seeking to have Congress make available now funds which normally would be allocated next year, so the transmission program could keep pace with the accelerated construction of generating equipment. He would not disclose the amount of money involved.

Observers point out that with government money available the PUDs should be able to settle differences and quickly form their lines to take over all private utility facilities in the Bonneville-Grand Coulee area. They point to what happened in Tennessee when the TVA pushed the private utilities out of the state.

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Laundry Campaign Launched by Edison

Details of the Consolidated Edison System companies' newest sales promotion activity, "Breeze Through Wash-Day," which deals with model home laundries and home laundry equipment, were given out to a group of 1,250 co-operating dealers, manufacturers and distributors at a dinner held to launch the campaign at the Hotel Astor last week.

"The campaign, which will be aggressively promoted during September and October, will feature three-year terms," said E. F. Jeffe, vice-president of Consolidated, "with monthly payments as low as $2, free home demonstrations and free installation and connection of equipment to appropriate outlets. A special course will be given

INTRODUCING NEW HOME LAUNDRY CAMPAIGN—Twelve hundred co-operating dealers, jobbers, manufacturers and distributors gathered at the Hotel Astor in New York last week, where Vice-President E. F. Jeffe of Consolidated Edison system outlined details of a new campaign on model home laundries and home laundry equipment

for domestics in the various boroughs and those completing the four two-hour courses satisfactorily will receive diplomas qualifying them as home laundry technicians."

Dealers will profit not only from their own sales but also from orders taken by Consolidated Edison System employees through a "pool" arrangement similar to the one used in previous campaigns; that is, 3 per cent bonus to employees, 3 per cent to reserve.

The National City Bank-Consolidated Edison finance plan will be available to eligible co-operating dealers. All equipment included in the campaign will be listed and filed under price maintenance agreement contracts.

Except in the territory in which Consolidated Edison supplies gas, no other promotions will be undertaken during this period and no other home laundry equipment other than that of the participating manufacturers and distributors will be displayed in the company's showrooms or financed under the National City Bank-Consolidated Edison plan during the campaign period.

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Lighting Equipment Group Holds Meeting

A two-day educational conference, designed as the first step in launching the new specification-certification program of the American Lighting Equipment Association, was held last week at the General Electric Institute, Nela Park, Cleveland.

The purpose of the conference was to acquaint the members of the A.L.E.A. with the various phases of the new program, to familiarize members with the scientific and engineering principles involved in certified fixtures and to outline ways and means by which the program will be promoted by the lighting industry.

Incorporating the Illuminating Engineering Society's recommended practice for the illumination performance of residential ceiling luminaires, the A.L.E.A. program provides that fixtures to carry the association's identification tag must be approved by the A.L.E.A. advisory board of design and certified as to conformance to specifications by the Electrical Testing Laboratories.

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Slattery on Defense Board

REA Administrator Harry Slattery has been appointed consultant for the power subcommittee under Edward R. Stettinius, Jr., head of the raw materials division of the Defense Commission. He will serve with representatives of the Army and Navy and Charles W. Kellogg and John C. Parker, representing the industry, all of whom previously were named consultants for the committee headed jointly by Gano Dunn and Leland Olds, chairman of the Federal Power Commission.

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Engineers Give Status

All electrical engineers in Maryland, as well as other engineers, are being requested to fill out an exhaustive questionnaire in regard to their complete status as the first step in a movement to aid the government in every possible way in its defense program. The plan has been launched by the Engineers Club of Baltimore.

EDUCATIONAL CONFERENCE—Seventy-eight representatives of utilities, electrical wholesalers, retailers and members of the American Lighting Equipment Association attended the two-day educational conference at the General Electric Institute, Nela Park, Cleveland, last week to discuss the specification-certification program

MEETINGS

International Association of Electrical Inspectors—Annual meeting, southwestern section, Santa Barbara, Calif., August 26-30; northwestern section, Great Falls, Mont., September 3-6; southern section, Houston, Tex., September 16-20; western section, Kansas City, Mo., September 23-27; eastern section, New York, N. Y., October 7-11.

American Institute of Electrical Engineers—Pacific Coast convention, Los Angeles, Calif., August 27-30; Middle Eastern district meeting, Cincinnati, Ohio, October 9-11; winter convention, Philadelphia, Pa., January 27-31. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

American Society of Agricultural Engineers—North Atlantic section, August 27-30. Orono, Maine; fall meeting, Chicago, December 2-6.

American Society of Mechanical Engineers—Fall meeting, Hotel Davenport, Spokane, Wash., September 3-6; annual meeting, New York, N. Y., December 2-5. C. E. Davies, national secretary, 29 West 39th St., New York, N. Y.

Pennsylvania Electric Association—Annual convention, Bedford Springs Hotel, Bedford, Pa., September 4-6. A. B. Millar, managing director, State Street Bldg., Harrisburg, Pa.

Maryland Utilities Association—Fall convention, George Washington Hotel, Ocean City, Md., September 6-7. G. F. Jones, secretary, Potomac Electric Power Co. Building, Washington, D. C.

Illuminating Engineering Society—Annual meeting. Essex and Sussex Hotel, Spring Lake, N. J., September 9-12. F. G. Horton, exective secretary, 51 Madison Av., New York, N. Y.

Rocky Mountain Electrical League—Annual convention, Albuquerque, N. M., September 9-11. George Lewis, Manager, Gas & Electric Building, Denver, Colo.

Wisconsin Utilities Association—Annual convention, accounting section, Lawsonia Hotel, Green Lake, Wis., September 16-17; electric section, commercial and technical divisions, Hotel Pfister, Milwaukee, November 11-12. A. F. Herwig, executive secretary, 135 West Wells St., Milwaukee, Wis.

Southeastern Electric Exchange—Engineering and operation section, Fort Sumter Hotel, Charleston, S. C., September 19-20. J. W. Talley, executive secretary, 308 Haas-Howell Bldg., Atlanta, Ga.

Association of Iron and Steel Engineers—National convention, Chicago, Ill., September 24-27. Brent Wiley, managing director, Empire Bldg., Pittsburgh, Pa.

Indiana Electric Association—Annual convention, French Lick, Ind., September 25-27. R. E. Blossom, secretary, 1414 Circle Tower, Indianapolis, Ind.

Empire State Gas and Electric Association—Annual convention, Westchester Country Club, Rye, N. Y., September 26-27. George H. Smith, secretary, Grand Central Terminal, New York, N. Y.

Electrochemical Society—Fall meeting, Ottawa, Canada, October 2-5. Colin G. Fink, secretary, Columbia University, New York, N. Y.

Edison Electric Institute—Electrical equipment committee, Jefferson Hotel, Richmond, Va., October 7-8; transmission and distribution committee, Henry Grady Hotel, Atlanta, Ga., October 14-16. H. S. Bennion, managing director, 420 Lexington Av., New York, N. Y.

International Municipal Signal Association—Annual meeting, Roosevelt Hotel, Jacksonville, Fla., October 14-17. Irvin Shulsinger, secretary, Eight East 41st St., New York, N. Y.

American Welding Society—Annual meeting in conjunction with the National Metal Exposition, Cleveland, Ohio, October 20-25. Miss M. Kelly, secretary, 29 West 39th St., New York.

National Electrical Contractors Association—Fall meeting, George Washington Hotel, Jacksonville, Fla., October 21-23. L. W. Davis, general manager, 420 Lexington Avenue, New York, N. Y.

National Electrical Wholesalers Association—Semi-Annual convention, Hotel William Penn, Pittsburgh, Pa., October 22-25. E. Donald Tolles, managing director, 165 Broadway, New York, N. Y.

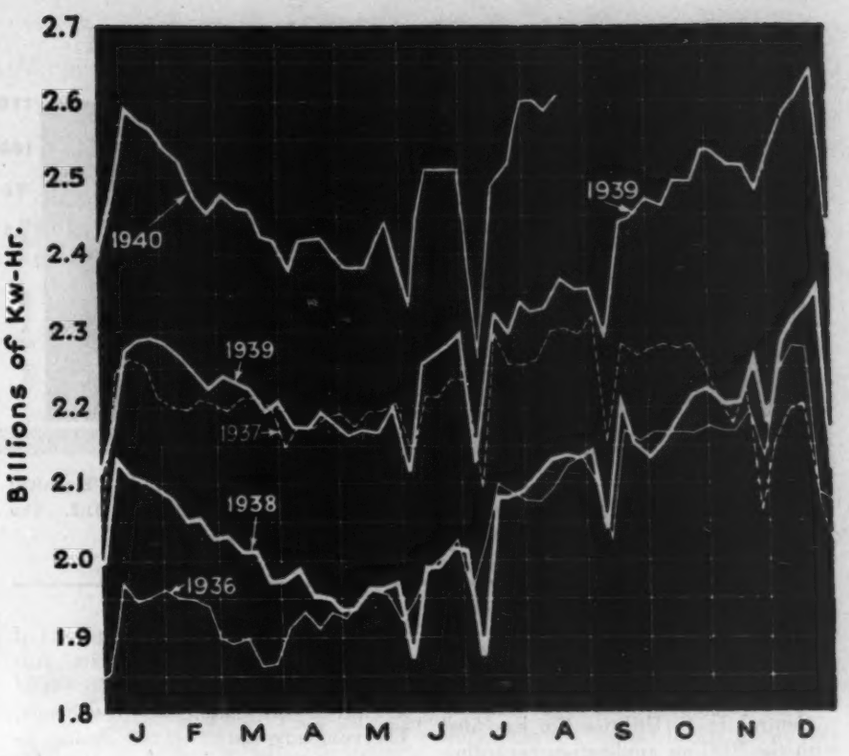
National Electrical Manufacturers Association—Annual meeting, Waldorf-Astoria Hotel, New York, N. Y., October 27-November 1. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

Seasonal Rise Sends Output to New High

Gain in energy output in the week ended August 17 was sufficient to set a new record for 1940, production of electricity in that week amounting to 2,606,122,000 kw.-hr., according to the Edison Electric Institute. The advance over the corresponding week of 1939, however, was less than in the previous week, being 10.1 per cent, as against 11.0 per cent.

Output in the week ended August 17 was 21.8 per cent ahead of the corresponding week of 1938 and 13.1 per cent ahead of 1937. It was still 1.3 per cent under last winter's peak. A year ago output went above the previous winter peak; in the corresponding week of 1937 output was 1.1 per cent ahead of the winter peak.

Only the Central Industrial region had a higher percentage gain in the week ended August 17 over last year. Decrease in the Southern States reflected the hurricane during the early part of the week. Cooler weather prevailed throughout the West Central region.



Weekly Output Millions Kw.-Hr.

1940		1939		1937	
Aug. 17	2,606	Aug. 19	2,368	Aug. 21	2,304
Aug. 10	2,589	Aug. 12	2,333	Aug. 14	2,301
Aug. 3	2,605	Aug. 5	2,325	Aug. 7	2,262
July 27	2,601	July 29	2,342	July 31	2,256
July 20	2,524	July 22	2,295	July 24	2,259
July 13	2,483	July 15	2,324	July 17	2,298

Per Cent Change from Previous Year

	Week-Ending		
	Aug. 17	Aug. 10	Aug. 3
New England	+ 3.1	+ 3.7	+ 3.4
Middle Atlantic	+ 5.6	+ 6.4	+ 8.0
Central Industrial	+16.4	+15.9	+17.5
West Central	+ 8.5	+11.1	+14.9
Southern States	+ 8.1	+11.2	+15.0
Rocky Mountain	+18.2	+19.4	+21.5
Pacific	+ 5.0	+ 5.3	+ 3.7
United States	+10.1	+11.0	+12.0

Sees Expanding Rural Electrification in Illinois

Distribution of its 1940 map of electric transmission and distribution lines in Illinois has been begun by the state Rural Electrification Committee. Now in its fourth edition, the map is believed to be the only one of its kind published.

Continued growth in rural electrification in Illinois is seen by Executive Secretary J. Walter Marquardt, who reported that since July 1, 1940, the REA has allotted $1,237,500 to this state to build 1,576 lines of rural lines to serve 4,435 farms. Approximately $7,000,000 has been earmarked for Illinois by REA this year.

•

Canada Employment Gains Result from War

Reflecting the change in trend in the Canadian employment situation as a result of the war in Europe, the index of employment in the electric light and power industry on June 1 was 137.5, as against 126.9 on June 1 last year, according to the monthly letter of the Royal Bank of Canada. The average for the first six months of 1940 was 133.2, as compared with 125.6 in the first six months of last year and with 132.8 for all of 1939.

Index of employment in the electrical apparatus manufacturing group was 147.3 on June 1, as compared with 129.1 on June 1 a year ago. For the first half of 1940 the average index was 142.1, as against 125.9 for the first half of 1939 and 130.4 for all of last year. Index for all manufacturing employment advanced to 129.2 for June 1, the highest on record for that date. Index for the first six months of the current year was 123.3, as against 107.4 for the same period of last year.

•

PUD to Buy Utility

The Grays Harbor Public Utility District has completed negotiations for the purchase of the properties of the Twin Harbors Electric Co. and will take over the holdings on August 31. The price agreed upon was $59,662. Previously the PUD had threatened to build a competing system if the utility failed to sell. The system will be rehabilitated, involving an outlay of approximately $40,000.

REA-Utility Line Dispute Settled by Compromise

Controversy between Rural Electrification Administration and the Kentucky-West Virginia Power Co. over 9.4 miles of line was settled by compromise at the conclusion of a three-hour hearing before the Public Service Commission.

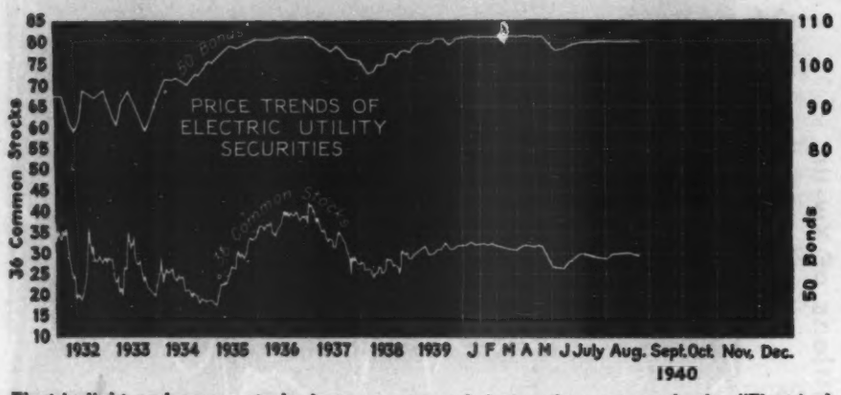
The utility agreed to waive its permit to build the line, while REA agreed to buy energy wholesale from the utility to serve the proposed Licking Valley Rural Electrification Co-operative in five Kentucky counties.

•

Electric Range Prizes

Utility representatives who sell, lease or rent during the calendar year 1940 the greatest number of individual domestic electric ranges may win substantial prize money from the R. B. Marshall award of $500 administered by the Edison Electric Institute. The purpose of the award is to stimulate activity and efficiency among utility retail salesmen. The award is divided into five prizes of $100 each, one in each of five classifications.

Light and Power Stocks Drift Downward


PRICE TRENDS OF
ELECTRIC UTILITY
SECURITIES
36 Common Stocks
50 Bonds
1932 1933 1934 1935 1936 1937 1938 1939 J F M A M J July Aug. Sept. Oct. Nov. Dec.
1940

Electric light and power stocks lost some ground during the past week, the "Electrical World" stock index moving downward to 28.6; last week, 29.1; last year, 31.8. The bond index stood at 105.5; last week, 105.8; last year, 105.6

Seeks to Sell Five Southwestern Units

Central U. S. Utilities Co. has filed with the SEC an application regarding the proposed sale of five of its operating subsidiaries to Dallas Rupe & Son, syndicate managers, of Dallas, Tex., for $3,340,000. The companies to be sold are Louisiana Public Utilities Co., Inc., Texas General Utilities Co., Panhandle Public Service Co., Arizona General Utilities Co. and Arkansas General Utilities Co.

To carry out the sale, Central U. S. Utilities Co. has organized another subsidiary, Southland Public Service Co. The new company is to acquire the assets of the five operating companies and will have outstanding $2,250,000 of 4¼ per cent first mortgage bonds, due 1965; $500,000 of 4 per cent debentures, series A, due 1944, and 150,000 shares of common stock, $5 par value. The bonds of Southland Public Service Co. are to be sold to various life insurance companies. A public offering of not less than 50 per cent of the common stock of Southland Public Service will be made at a price of approximately $9 a share. The remaining 50 per cent will be distributed to the members of the Dallas Rupe & Son syndicate.

•

Board Permits Utilities to Withdraw Petitions

SEC has consented to the withdrawal of a declaration of the Delaware Electric Power Co. regarding the redemption on October 1, 1940, at 102 per cent and accrued interest, of $200,000 of 5½ per cent gold debentures, due 1959.

The board has also announced the withdrawal of the application of Central States Edison, Inc., for approval of the purchase in the open market, during 1940, of not more than $60,000 of its fifteen-year collateral trust bonds. The company stated that it desires to purchase the bonds in accordance with Rule U-12C-1 as amended, and that the bonds will be canceled upon acquisition.

SEC has authorized the Arkansas Power & Light Co. to withdraw its application regarding the proposed sale to the Rural Electrification Administration of $200,000 of first and refunding bonds, 2.73 per cent series, due 1959, and $93,000 of first and refunding bonds, 2.88 per cent series, due 1956.

•

New Utility Issues Filed With Board

Central New York Power Corp. of Syracuse, N. Y., has filed an application with the SEC covering the issuance and sale of $6,000,000 of 3½ per cent general mortgage bonds, due in 1965, to the Equitable Life Assurance Society of the United States, and 105,263 shares of common stock, no par value, to its parent, Niagara Hudson Power Corp. The bonds are to be sold at 101 per cent and accrued interest and the stock at $28.50 a share. Proceeds from the sale of the securities are to be applied to the cost of the extension and improvement of the company's plant and property during the period from May 31, 1940, to December 31, 1941, which is estimated at $14,754,900.

Columbus & Southern Ohio Electric Co. has filed a registration statement covering $29,000,000 of 3¼ per cent first mortgage bonds. Proceeds will be applied chiefly as follows: To the redemption on November 2, at 105 and accrued interest, of $26,000,000 of 4 per cent first mortgage and collateral trust bonds due in 1965; to the redemption on or before October 1, at 104 and accrued interest, of $1,836,000 of 3¼ per cent first mortgage and collateral trust bonds, due in 1968.

At the suggestion of the Public Utilities Commissioners of the District of Columbia members of the SEC will sit with them on August 28 to pass upon an application by the Potomac Electric Power Co. for exemption from previous provisions of the Holding Company Act of the issuance and private sale to the Metropolitan Life Insurance Co. and Mutual Life Assurance Co. of $10,000,000 principal amount of first mortgage bonds, 3¼ per cent series, due 1975.

Proceeds of the financing, together with other funds of the company, will be used to maintain its normal working capital requirements and to meet its normal construction expenditures during the remainder of 1940 and during 1941 and those incident to the installation of two 50,000-kw. turbo-generator units and related equipment and facilities, one to be completed this year and the other to be begun in 1941.

•

I.C.C. Authorizes Refunding Issues

Interstate Commerce Commission has authorized the Iowa Electric Light & Power Co. to issue $12,600,000 of 3½ per cent first mortgage bonds, series A, and $1,980,000 of general mortgage serial notes.

The bonds and notes will be sold at par plus accrued interest. Proceeds will be used to redeem $12,600,000 of outstanding mortgage bonds, to improve the company's electric utility properties and to reimburse its treasury for expenditures made for capital purposes.

The I.C.C. took jurisdiction over the financing because the company operates railroad properties in interstate commerce.

•

Bond & Share Gets Stay

SEC has reconsidered the request of the Electric Bond & Share Co., granting an extension of the hearing on its corporate simplification to September 9.

Utility Reports

	Net Income 1940	1939
*American Utilities Service and subs.	$155,399	$186,198
*Buffalo Niagara Electric	3,500,537	2,347,616
*Columbia Gas & Electric and subs.	14,163,832	12,409,991
*Kansas Gas & Electric	1,286,857	1,204,930
*Minnesota Power & Light	1,402,304	1,225,851
*Mississippi Power & Light	462,188	594,288
*Nebraska Power	1,642,430	1,901,463
*Nevada-Calif. Electric and consol. subs.	297,486	393,912
*Niagara Falls Power and subs.	2,531,495	2,662,380
*Niagara, Lockport & Ontario Power and sub.	1,609,144	1,455,168
*Northern States Power (Wis.) and subs.	1,446,070	1,295,310
*Wisconsin Public Service and sub.	1,793,560	1,553,113

*Twelve months ended June 30.

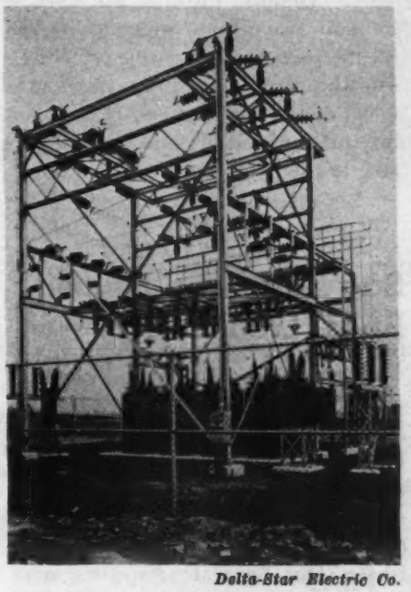
OPERATING PRACTICES

Automatic Switching at 34.5-Kv. Substation

Automatic restoration of service from a point remote from this unattended 34.5-kv. Midwest substation is permitted by the installation of switching equipment, which is arranged for the control and protection of two 33-kv. incoming lines and two 2.3-kv. outgoing feeders.

Both 33-kv. lines are normally energized and form part of a closed loop, feeding the transformers through an air-break switch and protective fuses. The high-pressure-contact line switches are motor-operated. Complete automatic control equipment is inclosed in a weatherproof housing. This equipment is arranged for the following sequence of automatic switching:

(1) Both air-break incoming line switches normally closed; (2) both switches will open on loss of voltage after a definite time delay; (3) either switch, but not both, automatically recloses, depending on which 33-kv. line is re-energized.



Delta-Star Electric Co.

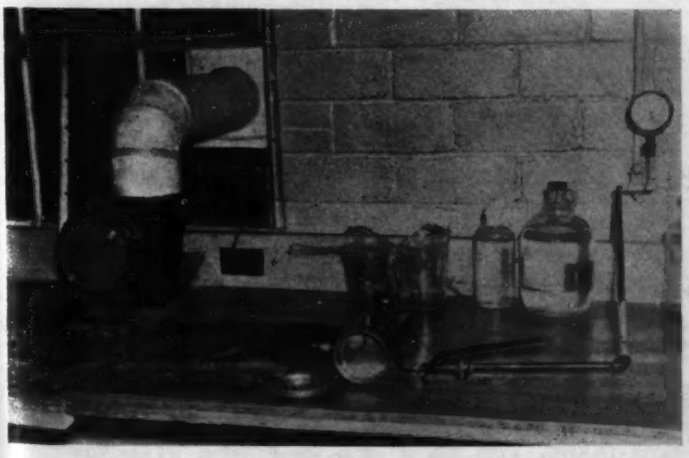
AUTOMATIC THROWOVER STATION reflects modern utility practice

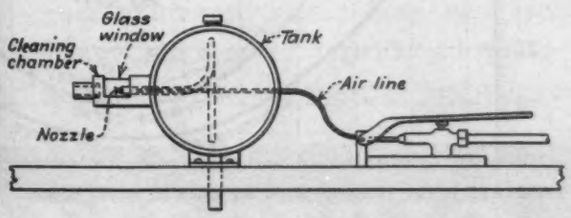
Provision is also made at the station for independent operation of either switch from a local control mounted in the control cabinet when such operation is desired.

Devise Home-Made Meter Jewel Cleaner

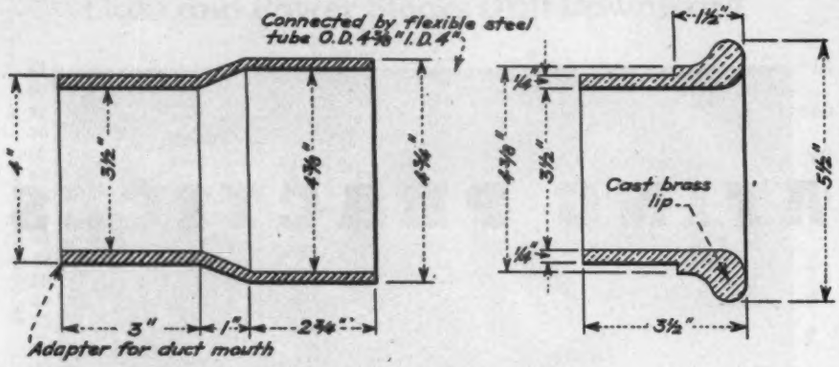
Instead of the usual small hand atomizer for cleaning meter jewels, a compressed air-operated "heavy-duty" carbon tetrachloride spray device is used in the electrical laboratory of the Consumers Power Company, Jackson, Miss., which was made from a Kodak developing tank, at very nominal expense. The device holds enough cleaning solution so that it does not have to be refilled frequently, and it has features that keep the fumes from annoying the operator.

As shown in the accompanying illustrations, a small copper air line is led from a valve in the 80-lb. shop compressed air supply system to an atomizer type jet that draws cleaning solution from the "developing tank" chamber. The jet discharges against the jewel within a small glass-windowed cleaning chamber, which confines the spray and keeps fumes from annoying the operator. Such fumes as do escape during cleaning operations are drawn from the room by a small centrifugal blower mounted on the bench beside the apparatus as shown.





MAKE meter jewel cleaner from Kodak developing tank (left). Siphon draws cleaning solution from supply chamber into exhaust chamber, working in conjunction with a jet in the 9⅜ x 3½-in. developing tank (below)



FLEXIBLE TUBE protects cable sheath from contact with manhole and duct edge during pulling

Flexible Guard for Cable Pulling

For pulling in cable on the underground system of the Kansas City Power & Light Company a 4½-in. flexible steel protector tube has been found an effective means for protecting the cable sheath against accidental damage from contact with the edge of the manhole or duct mouth. These flexible guards are standard equipment on underground trucks in Kansas City, being carried in 6, 10 and 16 ft. lengths.

In use, the flexible tube is slipped over the end of the cable to be pulled and slid up to the reel to free the cable end for attaching the pulling rope. The cable and protective sheath are then pulled to the duct mouth. A tapered fixture at the duct mouth end of the flexible protector permits it to be inserted into the duct mouth a short distance. Fittings are carried for both round and square ducts. To insure that the cable runs smoothly into the protector a brass lip is provided at the entering end of the flexible tube, which offers a smooth surface to the cable sheath at this point.

•

Sag Template Helps Rural Line Design

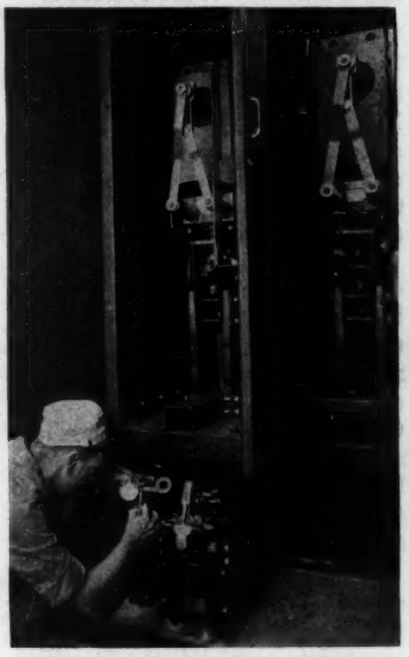
A special type of celluloid sag template designed with the object of speeding up work in laying out rural lines and at the same time reducing the risk of errors in draftsmanship is described in the *Journal of the Institution of Electrical Engineers* (British). This template dispenses with the alternative single-curve celluloid template or the older method of moving a transparent profile sheet over conductor curves drawn on paper or linen and finally tracing off. It is preferable to use thin squared paper (from which prints can be obtained direct) as the profile medium.

The template shown is based on 400-ft. maximum span of 0.045 sq.in. seven-strand copper; the horizontal scale is 100 and the vertical 10 feet per inch.

•

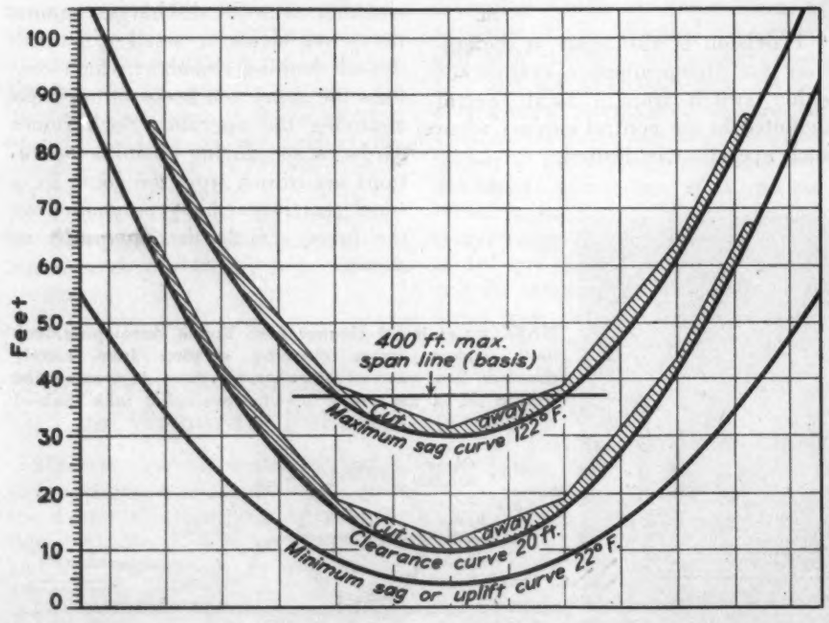
"Philadelphia Story" on Air Breakers

Experience over a period varying from two to nine years with twelve Westinghouse "Deïon" air circuit breakers in varying services on 13 and 4 kv. has indicated to the Philadelphia Electric Company that this type of breaker is simpler and less expensive to maintain than most oil circuit breakers of comparable rating and service.



OPERATOR CHECKS auxiliary relay on closing mechanism for 15-kv., 500,000-kva. starting breaker controlling frequency changer set at Schuylkill station of Philadelphia Electric

Philadelphia Electric now has about 80 breakers of this type in service on the system, 68 of which were installed during 1939 and early 1940. Eleven of the breakers are on 13.2-kv. service in a generating station and are the largest of this type

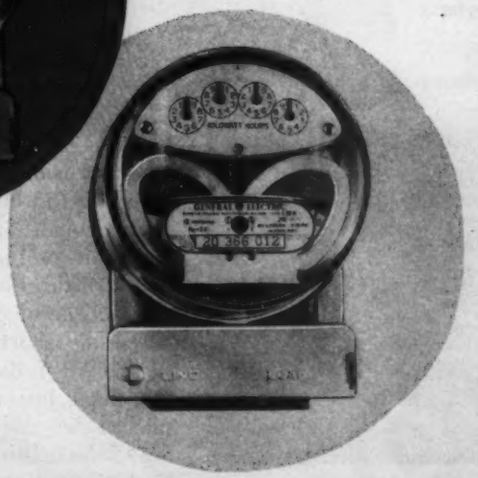


TEMPLATE is cut away to allow entrance of pencil point

NO, NOT A WATTHOUR METER!

TYPE T-52 TIME SWITCH

Note similarity of time switch and "A" type meter. The T-52 can be installed in any standard watthour-meter connection box or trim



Leaflet GEA-3472 contains more complete information. You can obtain a copy from the nearest G-E Office, or write General Electric Company, Schenectady, N. Y.

IT'S THE

NEW

G-E TIME SWITCH TO MATCH "A" TYPE METERS

For Off-Peak Control of Water Heaters

You can now reduce the expense of installations involving both watthour meters and time switches because here's a new switch that fits any standard watthour-meter connection box or trim.

There are other advantages in using the T-52:

EASY TO ADJUST—simply remove the glass cover from the standard meter base to set switch tripping time.

SIMPLE, STURDY MECHANISM—same reliable construction that has resulted in years of successful operation of G-E combination watthour meters and time switches.

DEPENDABLE—powered by the well-known Telechron motor.

BUILT TO LAST—positive make-and-break silver contacts—rated 40 amp, 240 volts—assure remarkably long life. Die-cast aluminum meter base and sealable, heavy glass cover provide adequate protection against the weather and tampering.

GENERAL ELECTRIC

built to date, having an interrupting rating of 37,000 amp. with a continuous rating of 2,000 and 3,000 amp. Fifty breakers on 13.2-kv. service and one on 4-kv. service have just been installed.

Significant performance data include: Maximum number of operations on any one breaker, 25 per year (based on 1,200-amp., 100,000-kva., 7.5-kv. breaker); number automatic openings, all breakers, eighteen (average) per year; approximate current interrupted on automatic openings, 9,500 amp. maximum, 3,700 amp. average. Maximum and average currents apply specifically to the 500,000-kva. breakers at Paschall and Washington stations and only to the first three years of the nine-year service period, no complete short-circuit calculations having been made after this on these or other breakers.

General inspection and maintenance practice is to inspect the 500,000-kva. breakers and the 100,000-kva. breakers annually, although both types may be given visual inspection after severe short-circuit interruptions. Time for inspection is less than that needed for oil breakers.

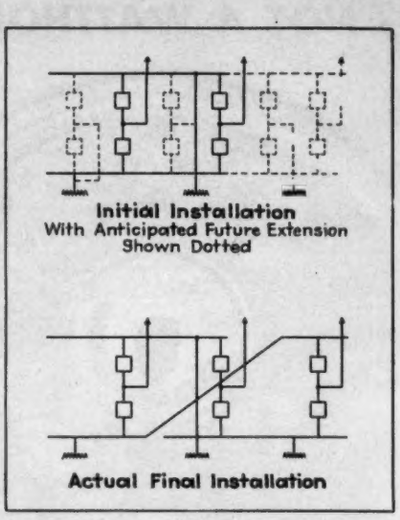
•

Ring Bus Effects Savings at Boulder

By T. J. LOVELL
Engineer U. S. Bureau of Reclamation, Denver, Colo.

When the 287-kv. switchyard was originally installed at Boulder power plant in 1936 a conventional double bus—with three transformer circuits and three outgoing lines—was anticipated as the ultimate installation. Designs were prepared in line with this expectation, although initially only two lines were installed. These were provided with two breakers each. A transformer circuit was connected directly to each bus.

Operating experience between 1936 and 1940—when the third transformer circuit and line were installed—indicated that the cost of a complete double-bus installation was not justified. A three-section ring bus was considered adequate. One transformer circuit is connected to each section of the ring. Arrangement of breakers is such that any one of the three outgoing lines can be connected to one or both of two sections.

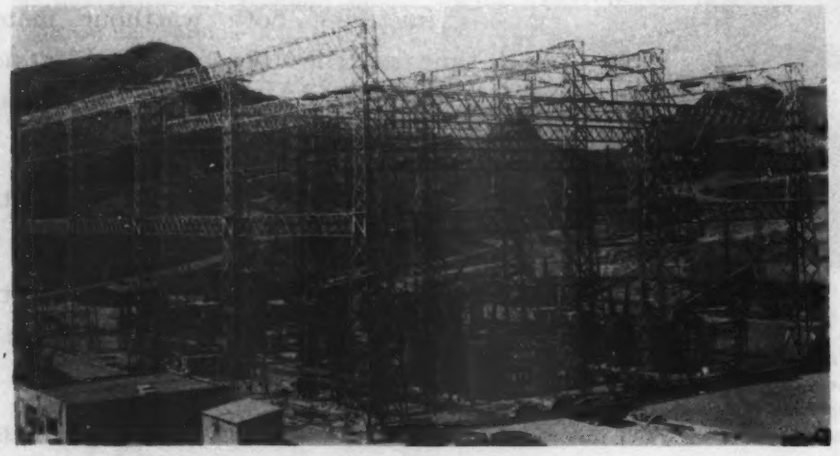


ORIGINAL AND FINAL PLANS for adding third 287-kv. circuit at the Boulder switchyard

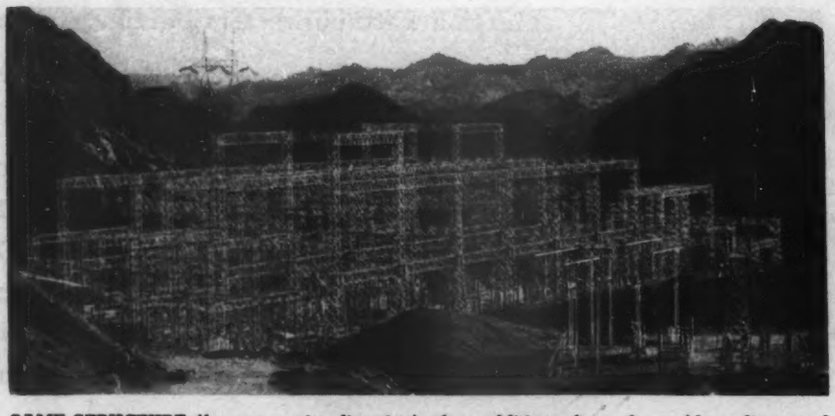
The method of converting a double-bus into a three-section-ring design has some interesting features. The fact that the switchyard is built in a narrow canyon precluded closing the ring by horizontal expansion of structures, but fortunately the structural design was such as to permit vertical extensions.

Relative positions of lines and transformer circuits were such as to make possible the arrangement shown in the accompanying illustrations and at the same time to keep structural changes, and hence outage time, at a minimum.

Since the buses are supported at intermediate bay points by suspension insulators, sectionalizing of one bus was accomplished by replacing the suspension insulator with a yoke and dead-end insulators. The sectionalizing point of the other bus occurred at the junction of the old and new structures and involved no difficulties. The necessary connection between the short sections of bus on each side of the structure, to form the third bus section, was accomplished by adding another bus on top of the existing structures, the vertical risers being taken up in bays having no breakers or disconnecting switches.



ORIGINAL 287-kv. switchyard at Boulder, with four bays for two transformer circuits and two lines



SAME STRUCTURE (from opposite direction) after addition of two bays (three lines and three transformers), as well as bus dead-ending structures at the tops of diagonally opposite corners

INCREASED PRODUCTION

2. Improve Power-factor with G-E Pyranol Capacitors to Release Circuit Capacity

If the power-factor of your electric circuits is low, you can gain capacity quickly and at low cost through power-factor improvement with G-E Pyranol capacitors. Capacitors neutralize reactive kva (nonworking current) and permit wiring to carry more working current.

If you purchase power and your contract contains a power-factor penalty or kva-demand clause, you will obtain direct savings from power-factor improvement that may pay for the capacitors in from one to three years.

Write for Bulletin GEA-77, "Pyranol Capacitors for Industrial Applications."

Capacitors Release Circuit Capacity—Pay for Themselves in 13 Months

"In 1937 we were faced with the necessity of increasing the electrical capacity of our plant, owing to increased production," writes L. Clayton Hill, manufacturing manager, Murray Corporation of America, Detroit. "It seemed imperative to install new feeders in order to reduce feeder loading and improve low-voltage conditions. Mr. Calley, our electrical engineer, made an intensive study and decided this result could be obtained by installing capacitors. "1440 kva of G-E Pyranol capacitors were purchased. Feeders are cooler, voltage is better. With a total expenditure of less than $13,000, our savings have averaged $1,000 monthly."

Proper Voltage for Better Light

Proper voltage of the lighting circuit in this industrial engineering office is maintained by these 1.5-kva Type AIRS induction voltage regulators, installed on an overhead beam. Before the regulators were installed, voltage was low, and regulation poor, because power was supplied through long, heavily loaded feeders. Proper voltage is particularly important on lighting circuits because lamp output drops even faster than voltage.

3. Install G-E Induction Regulators to Plug Production Leaks Caused by Low Voltage

Circuits may be adequate from the standpoint of current-carrying ability, yet the addition of more lamps, motors, and other equipment may cause excessive voltage drop. This results in low voltage with a falling off in lamp and motor efficiency and a slowing of production.

Effect of low voltage on lighting can be further aggravated by variations in power loads supplied from the same source.

To bring voltage conditions back to normal and step up production, install low-cost G-E air-cooled induction voltage regulators for circuits of 600 volts and below—Pyranol regulators for higher voltages.

Write for Bulletin GES-2285, "What's the Answer?" when poor voltage hampers production.

ACT TODAY

Ask our representative for complete information about these time-saving, economical methods of obtaining an adequate power supply. He will be glad to study your needs—if necessary with the aid of our specialists in power distribution—and help you select the apparatus that best meets your requirements.

GENERAL ELECTRIC

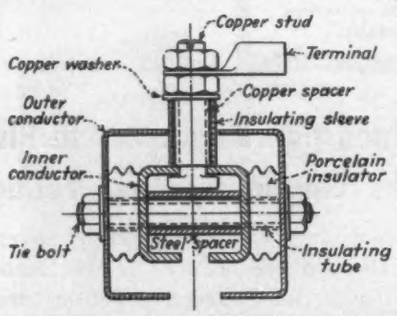
402-14

INDUSTRIAL ENGINEERING

Concentric Bus for Resistance Welders

By W. SPECHT
Philadelphia Works, General Electric Company

A new type single-phase concentric channel bus for resistance welders is comparatively small, keeps down reactive drop and skin effect, is easy to install and may be tapped easily at any location.



CONCENTRIC CHANNEL BUS for single-phase resistance welders keeps down reactive drop and skin effect and may easily and conveniently be tapped

Concentrically shaped channels, arranged to form a double hollow square, are held apart by steel and porcelain spacers, the vertical slot thus formed through both channels providing ample ventilation. Porcelain insulators separate the inner and outer channels and provide sufficient creepage separation for the rated voltage. Tie bolts, incased in insulating tubes, are spaced sufficiently close to hold the structure together against magnetic stresses set up by short-circuit currents.

Connections may be made to the inner pair of channels at any point by a copper stud. Rectangular head of this stud contains two line contacts bearing against the channel. One of the welding conductors is fastened to the outer end of the stud, while the other usually is fastened under the bolt in contact with the outer channel bus.

The concentric channel bus may be used on an ungrounded system, in which case insulation is required between the return conductor and ground, or may be installed with the return grounded, in which case the return conductor acts as a protective covering to the inner pair of live channels. Protective covering may also be provided for the bus on an ungrounded system by adding a housing.

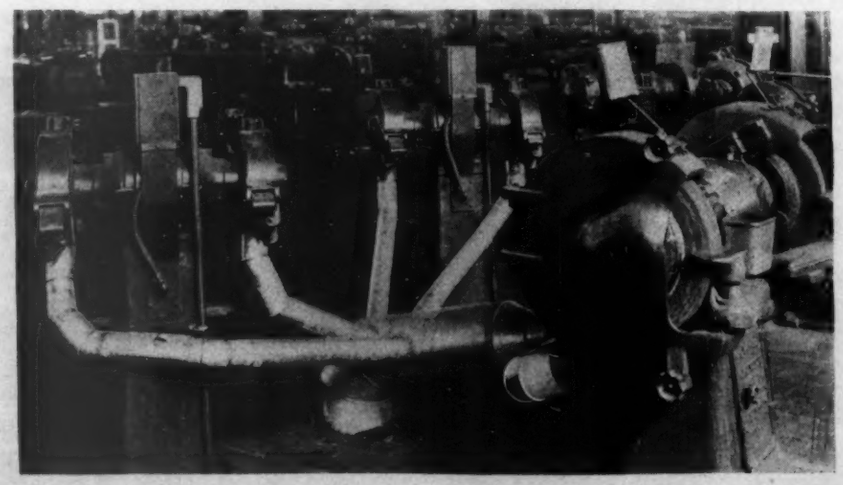
A 4-in. concentric channel bus of this construction with a continuous current-carrying capacity of approximately 3,200 amp. at 30 deg. C. rise in open air will ordinarily handle a connected load five to six times that amount without exceeding 30 deg. C. rise on the bus copper. This is possible because not all of the welding machines are in operation at the same time and also because different duty cycles are employed for different work.

If 4-in. channels are arranged in two hollow squares side by side on 7-in. centers the complete reactive drop will be approximately 43×10^{-6} volts per amp. If the two conductors are arranged concentrically the drop is only 33 per cent of this amount.

•

Direct Drives Serve Grinder Battery

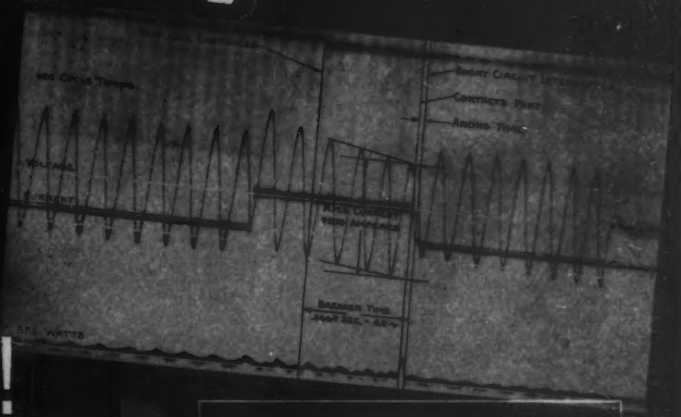
The flexibility of direct motor drives under unusual conditions is well illustrated in a New England repair shop where it was necessary to locate a battery of three double grinders non-symmetrically with regard to floor space used. The conduit runs beneath the floor were readily brought out to serve the across-the-line starting switches inclosed in metal cases out of range of the operators' positions, with short



CONDUIT supplies motor units mounted on intersecting axes

GET Shorter Interrupting

AND ARCING TIMES WITH THE NEW ALLIS-CHALMERS AIR BLAST CIRCUIT BREAKER!

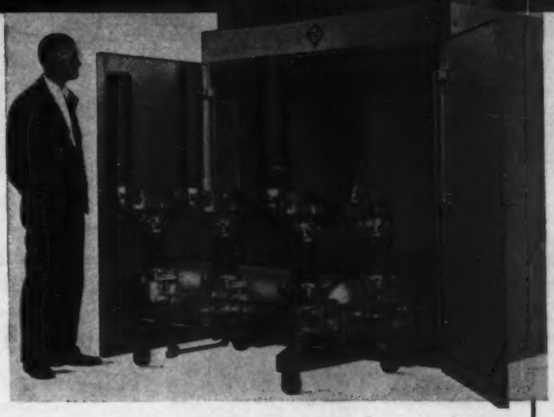


Short Circuit Troubles Are Blown Away by the Split Cycle Speed That Saves You Money! Here's the Modern Way to Cut Costs on Your System . . . with the New Allis-Chalmers Air Blast Circuit Breaker!

Shorter interrupting and arcing times . . . freedom from excessive contact burning and high voltage transients! That's why we honestly believe the split cycle speed of the new Allis-Chalmers Air Blast Circuit Breaker can cut costs for you on your system.

For this modern, high-speed breaker blows out arcs *fast* . . . consistently in one-half cycle or less! The pre-stored energy of compressed air is used for the two-fold function of contact operation and circuit interruption. Interrupting and arcing times are reduced to a new low!

Here's what that means to you . . . First, you get added protection for the equipment on your lines . . . longer contact life . . . decreased maintenance costs. And, second, you get faster reclosing times . . . quicker restoration of service . . . increased customer good-will.



OSCILLOGRAPHIC test record of a 500,000 kva Allis-Chalmers Air Blast Circuit Breaker interrupting 192,000 kva at 11 kv. Note the short arcing time—only 1/270 of a second.

A NEW HIGH IN ALL-around circuit breaker performance — that's what you get with the split cycle speed of the new Allis-Chalmers Air Blast Circuit Breaker. Shown here is a 500,000 kva breaker.

New High in Performance!

Through the automatic insertion of paralleling resistors, high frequency transients are dampened . . . and your breakers operate independent of the rate of rise of recovery voltage. Now you can control this factor that has long been a trouble-maker!

Add to these money-savers the increased safety . . . the decreased maintenance . . . the easier inspection afforded by the elimination of oil . . . and you get a combination that gives you a new high in all-around circuit breaker performance!

Find out how the new Allis-Chalmers Air Blast Circuit Breaker can save money on your system. Call the district office near you or write direct to Allis-Chalmers, Milwaukee.

A 1267

Over 90 Years of Engineering Superiority Work for You When You Specify Allis-Chalmers!

AC

ALLIS-CHALMERS

MILWAUKEE · WISCONSIN

flexible conduit runs to the motor terminals. Complete freedom from overhead obstruction was assured, and the exhaust duct system for removing metallic dust provided short connections between the machine units and a 10-in. central discharge duct serving the triple set-up.

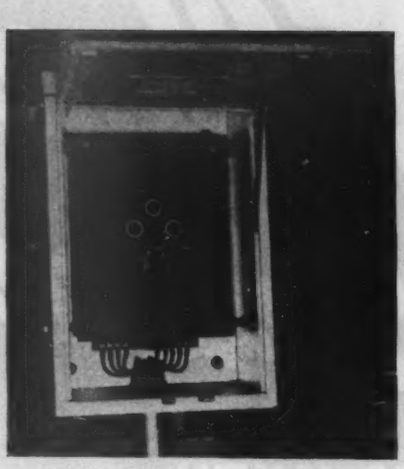
The two grinder units at the rear and left are each equipped with double wheels and a 3-hp., 550-volt, three-phase induction motor running at 1,890 r.p.m., the unit in the foreground being run at 1,250 r.p.m. by a 7.5-hp. motor. From each grinding wheel of the two smaller units a 3½-in. galvanized iron duct receives the exhausted dust for delivery into the main duct above mentioned. The larger unit is served by two 4-in. discharge ducts. The grinder wheels are of approximately 12-in. initial diameter on the smaller units and 20 in. in diameter on the large unit.

•

Breaker Control Outside Station Fence

Not infrequently it becomes necessary for an industrial concern to operate its main supply breaker, either to open or close it. If the breaker is of the non-reclosing type and operating control is inside a utility-owned substation that is kept (and quite rightly) under lock and key, considerable time and money may be wasted before access can be had to the breaker control.

To avoid this difficulty in the case of a utility-owned substation serving a large industrial plant in the Beaumont area a remote breaker control has been mounted in a weatherproof



INDUSTRIAL PLANT operators control breaker from position outside fence of utility-owned industrial substation. Interlocks permit utility to take over control during maintenance operations, for safety

cabinet outside the substation fence, accessible to the industrial plant operators.

The breaker control and its inclosure are shown in the accompanying illustration. For obvious safety reasons, interlocks are provided which make it impossible to operate the circuit breaker from this position if the utility is working on the circuit. Three signal lights on the external breaker control indicate the condition of the breaker—a red light shows if the breaker is closed, a green light if the breaker is open and a purple light indicates that the interlock is working and that control of the breaker has been taken away from the industrial control station.

The oil circuit breaker which this control operates is in the secondary circuit of a bank of three 1,000-kva., 33/3.2-kv., gas-sealed transformers. It is a non-reclosing breaker. If the breaker is tripped out for any reason the breaker stays out of service until either the industrial operator or the utility operates the control to close it again, restoring service. The substation was designed and is owned by the Gulf States Utilities Company, Beaumont, Tex.

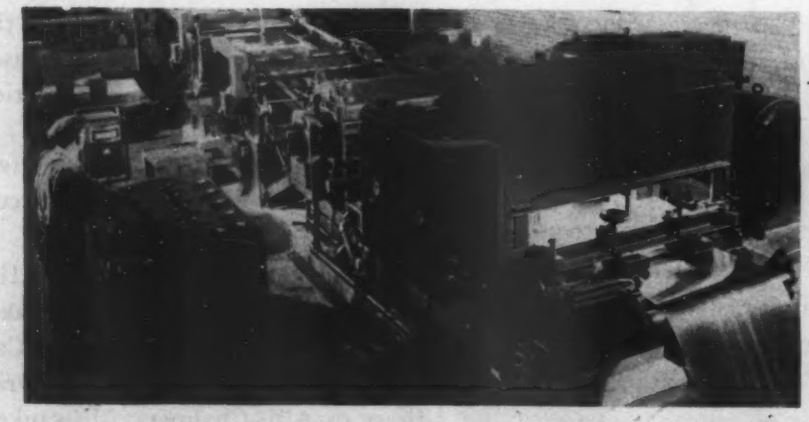
•

Phototube Detects Pin Holes in Steel

Holes as small as one-hundredth of an inch can be spotted in steel strip moving up to 1,000 ft. per minute by a Westinghouse photo-electric hole detector in this steel mill shearing line.

Edges of steel strip are trimmed to uniform width before entering hole detector between guides and hold-down blocks that guide the flying strip through the shear. Light source of 3,000-watts—two 110-volt, 1,500-watt Mazda lamps—is mounted in the overhead inclosing cabinet and the phototube housing is mounted below the moving metal strip. Slightest hole in the strip lets the light through, actuating the nine "CE-15" phototubes arranged for "staggered" scanning and a marking device that scores the strip beside the hole.

Immediately beyond the pinhole detector is a flying shear to cut the strip into varying lengths. After leaving the shear the sheets go to a classifier which has a gate timed with the hole detector to open and discharge defective sheets to a hole below.



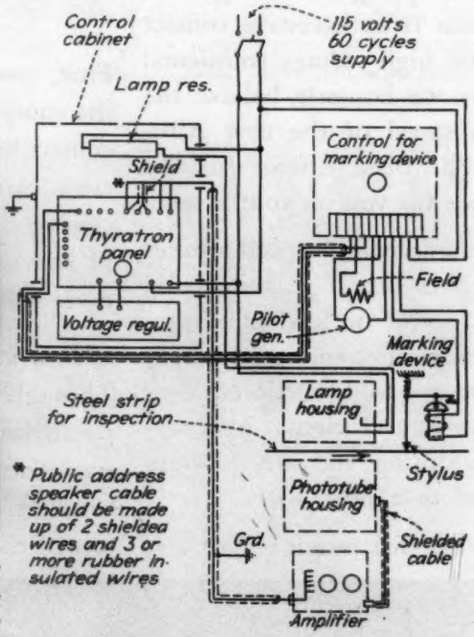
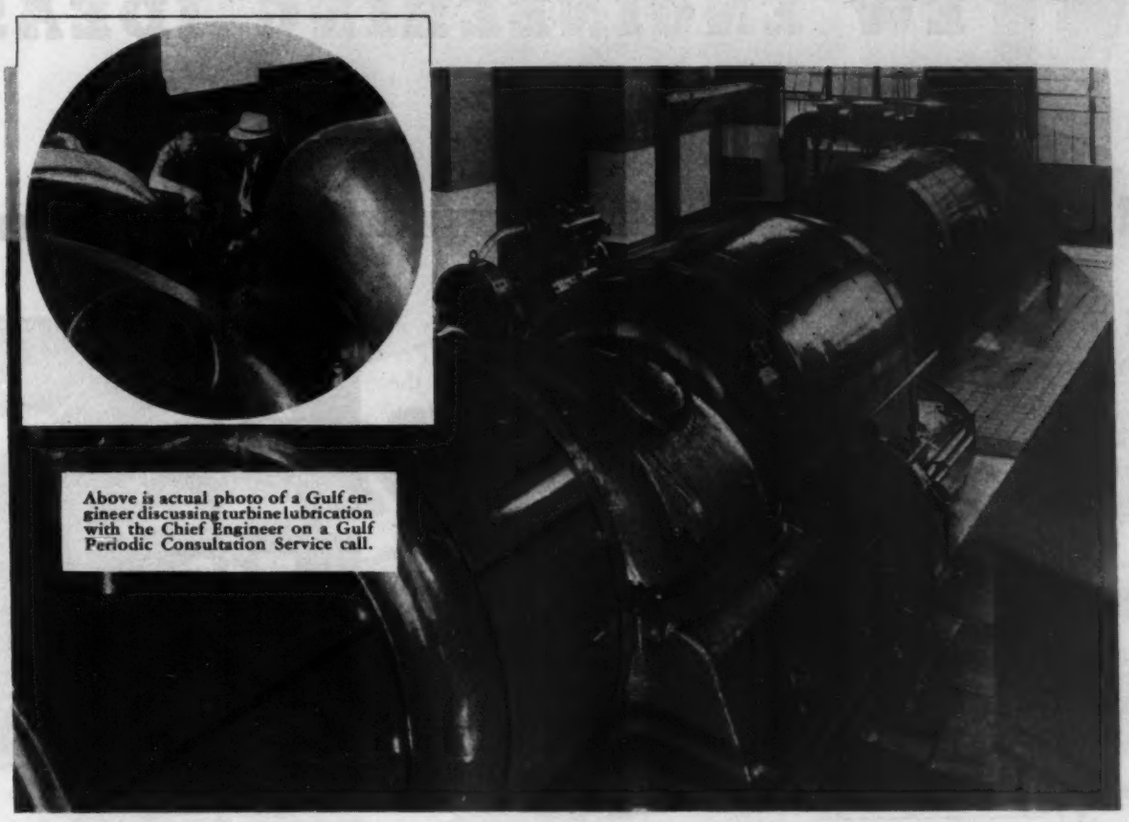


PHOTO-ELECTRIC HOLE DETECTOR and marker are operated and adjusted by control devices in the boxes at the near side of the hole detector. From his control desk the operator can manipulate the steel through the entire shearing line

"GULFCREST OIL *is making a fine record"*

...says Chief Engineer



Above is actual photo of a Gulf engineer discussing turbine lubrication with the Chief Engineer on a Gulf Periodic Consultation Service call.

"and GULF PERIODIC CONSULTATION SERVICE helps us maintain proper Lubrication Practice"

● "We see practically no evidence of deterioration in this remarkable oil—Gulfcrest is the finest turbine lubricant we have ever used," says this Chief Engineer.

Power plant men all over the country know Gulfcrest Oil as the most stable turbine lubricant they have ever used. And for good reason: *Gulfcrest Oil is especially refined and purified by the Alchlor Process,* the most effective method yet developed for removing undesirable hydrocarbons and other impurities which cause oxidation and sludge formation. Gulfcrest Oil has greater resistance to deteriorating influences and, therefore, longer life in service.

Ask the Gulf engineer to give you the complete story about Gulfcrest Oil, and what it can do for you—ask him to explain how Gulf Periodic Consultation Service will help you maintain greater lubricating efficiency. You will not be obligated in any way.

GULF INDUSTRIAL LUBRICATION

This booklet will suggest to you a practical method by which you can increase lubrication efficiency. Write for your free copy.

Gulf Oil Corporation - Gulf Refining Company
3813 Gulf Building, Pittsburgh, Pa. E.W.

Please send me my copy—no charge—of the booklet "GULF PERIODIC CONSULTATION SERVICE"

Name.....

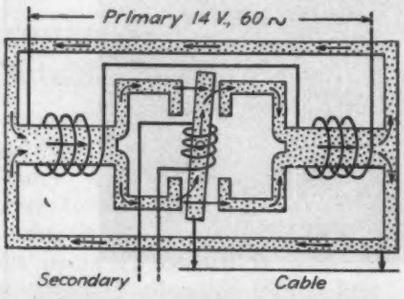
Company.....

Address.....

NEW ENGINEERING IDEAS

Field Tool Gauges Movement of Cables

Other electric utilities making similar studies should find useful a magnetic strain gauge developed by the Bell Telephone Laboratories to measure small longitudinal movements in the sheathing of aerial cables. Primarily intended for studying the daily movements produced by temperature changes, it can detect vibratory strain caused by wind sway and passing vehicles.



Between the poles of an electromagnet, excited by 60-cycle a.c., is an armature attached through a clamp to the cable so that it moves in the magnetic gap when the cable expands or contracts. This motion changes the flux through the armature and varies the current induced in the coil surrounding it. The armature current is applied to a thermocouple and the millivolt output read on a potentiometer or recorded continuously on an autographic recorder.

Bell Telephone Laboratories

MAGNETIC INSTRUMENT proves useful field tool for determining small movements in aerial cables

Motion of 0.00001 inch can be detected by gauge; cable sheath may move from 0.000005 to 0.00012 inch per inch per deg. F., depending upon the position of the gauge along the cable.

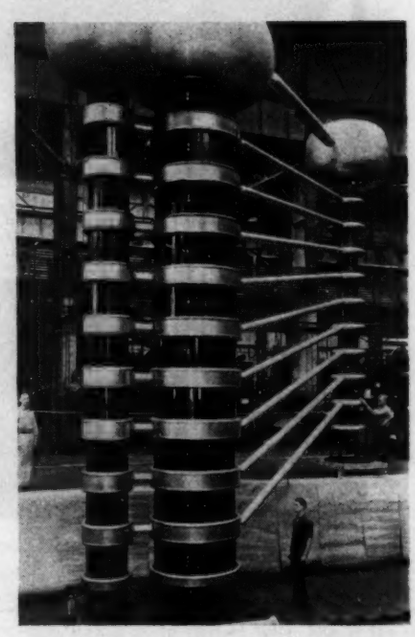
•

High-Voltage, D.C. X-Ray Outfit

By H. S. HUBBARD
General Electric Company, Pittsfield, Mass.

While intended primarily as a source of potential for multi-section X-ray tubes, a new 1,400,000-volt d.c. constant-potential generator incorporates many design features which will permit its use for general research in d.c. high-voltage phenomena. The generator, rated at 15 milliamperes with a voltage ripple of only 0.1 or 1 per cent per milliampere, is believed to be the highest-powered equipment ever manufactured for the purpose. Built by the Pittsfield Works of the General Electric Company, it has just been installed in the new high-voltage laboratory of the National Bureau of Standards, Washington, D. C. The X-ray tubes for operation with this generator were constructed in the X-ray research section under Dr. E. E. Charlton of the G. E. research laboratory in Schenectady. The high-resistance potentiometer to be used for voltage measurements was constructed by Dr. L. S. Taylor's X-ray group in the National Bureau of Standards in Washington. This description is limited to that part of the equipment of most general interest to electrical engineers.†

Ten units were selected for the



DESIGN of high-voltage d.c. generator for X-ray use adapts it to general research use

Complete assembly is connected to housing for multiple-anode X-ray tube at right. Center stack contains ten 140-kv. transformer and rectifier units. Resistance divider at left provides potential grading shields and operates in insulating gas at 15-lb. pressure. Aluminum caps and shields on the Herkolite* tube prevent corona.

*Registered G.E. trademark.

†A detailed description of the complete unit was published by E. E. Charlton and H. S. Hubbard in the *General Electric Review* for July.

Typical Wagner air cooled transformer for industrial use. Transformer shown is rated 10 kva, 230/460 to 115/230 volts, 60 cycles, single phase.

Typical Wagner sub-station transformer. Transformer shown is type HEB-K rated 150 kva, 7200 to 2400 volts, 60 cycles, single phase.

Typical Wagner Stud-Bushing type transformer for pole or platform mounting. Transformer shown is type HEB, rated 25 kva, 2400 to 120/240 volts, 60 cycles, single phase.

WAGNER

Distribution Transformers for all Types of Service

Whatever your needs may be, the Wagner line of transformers is so extensive in sizes and types that it includes transformers that will exactly fit your system's service requirements.

Wagner transformers embody the very latest developments in transformer design and manufacturing methods. They are liberally designed throughout, thus assuring plus performance with maximum efficiency. Wagner transformers help power companies meet the ever-growing demand for greater efficiency. They do their part too, in maintaining the uninterrupted service which is now expected—even demanded of the power supplier.

All over the country Wagner transformers are establishing records for performance and dependability.

The engineering and construction features of Wagner transformers are the reasons why more and more companies are selecting Wagner. These features are fully discussed in Bulletins TU-180 (distribution) and TU-181 (power).

WRITE FOR YOUR COPIES TODAY!

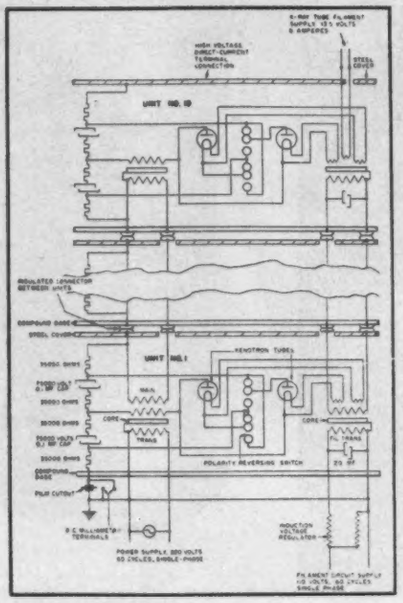
Typical Wagner Primary Pocket Stud type transformer for pole or platform mounting. Transformer shown is type HEX, rated 50 kva, 2400 to 120/240 volts, 60 cycles, single phase.

Typical Wagner Rural Line Transformer. Transformer shown is type HEB-F, rated 1½ kva, 7200 to 120/240 volts, 60 cycles, single phase.

Wagner Electric Corporation

6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.

TRANSFORMERS • MOTORS • FANS • BRAKES



ELEMENTARY CIRCUIT is full-wave voltage-doubling-rectifier connection

While referred to as a series circuit, actually only the capacitors operate in series when delivering energy to the external circuit.

generator, first, to provide a convenient voltage in the selection of various component parts making up the generator, and, second, to utilize a maximum of 140 kv. per section of the multiple-anode X-ray tube to which each stage is connected. Each main unit, separately oil-filled, contains: A three-winding main plate transformer arranged for series excitation of the ten units; a four-winding filament transformer, likewise designed for series operation of the units; two two-element kenotron rectifier tubes; two 75-kv. capacitor units; a reversing switch so that both polarities may be obtained, and protective resistors for the plate circuit.

The regulation due to the primary excitation of the series of ten units is reduced to the minimum by careful design of the transformers. The regulation is also considerably benefited by the rectifier circuit, since the power factor is relatively high. Furthermore, because of the parallel charging, the regulation is not affected by a slight phase shift which is inherent with the usual a.c. circuit of this type.

•

Accurately Locates Accidental Grounds

In the operation of ungrounded distribution systems the quick, accurate location of accidental grounds is a necessity, since delay may permit a second ground condition to develop, with resulting loss of a portion of the system and consequent interruption of service. An electromagnetic ground locator of its own design is used by the Consumers Power Company, Jackson, Mich., on its ungrounded system. The device consists essentially of a portable detector coil connected to a simple amplifier circuit, tuned particularly for the fifth harmonic. Accidental grounds on ungrounded systems cause the harmonic current components to be much stronger due to the capacitance effects to ground and so can be quickly detected.

To operate the detector the trouble shooter carries the coil and amplifier along the suspected line, and as the coil approaches the location of the ground a sharp increase is noted in the signal strength of the amplifier. Contrasted with radio type ground detectors, which may pick up a signal four or five blocks from the location of the trouble, indication of the electromagnetic detector is confined to a region 100 ft. on each side of the trouble spot. At the exact location the signal strength increases greatly, falling away sharply on either side.

Operation of the device is not limited to ungrounded systems, however. On grounded systems the blown fuse in the suspected area is removed and a reactor (which may be merely a coil of No. 8 wire) is inserted in its place so as to limit the fault current on a 4,800-volt circuit, for example, to about 10 amp. Then the detector is used as with the ungrounded system. By inserting an appropriate filter in the amplifier circuit it is possible to tune it for frequencies most pronounced on the circuit in question.

•

Temperature Rise by Solar Radiation

By C. W. PENNEY*
Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.

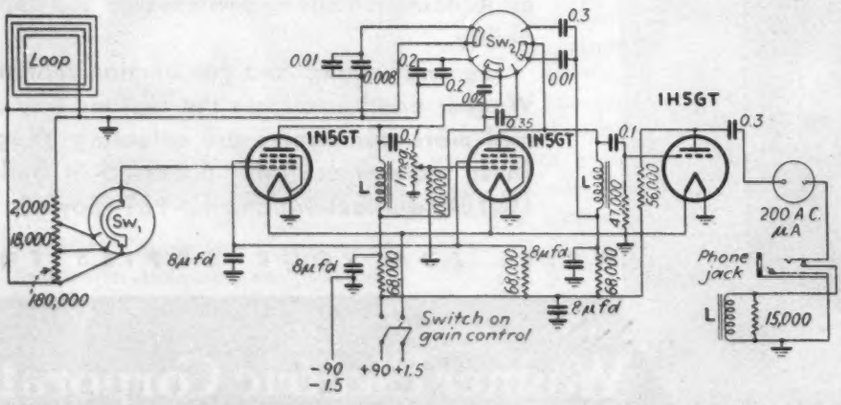
The effect of radiation on the temperature rise depends on the enveloping area of a device. In apparatus with a smooth exterior surface and without fans or liquid cooling, radiation to surrounding objects is usually more important than convection. In this case, the surface temperature of surrounding objects may be more important than the air temperature.

Solar radiation on clear days may be as high as 0.8 watt per square inch of surface normal to the sun.

The effect of solar radiation on the temperature rise of apparatus with forced air circulation or water cooling is generally negligible.

If apparatus cooled only by natural convection and radiation from a smooth surface is exposed to the sun and shielded from the wind additional temperature rise may be of the order of 20 deg. C. However, a wind velocity of a few miles per hour can compensate for the solar radiation. The effect of solar radiation can be decreased by painting the apparatus with white or gray paint.

High local temperature can result from unusual conditions, a common example being an object with a glass cover. An extreme example is the high temperature at the focus of a parabolic mirror or lens.



TUNED AMPLIFIER CIRCUIT for locating grounds on ungrounded distribution system

*Abstract of paper presented at A.I.E.E. Middle Eastern District meeting.

Remote Control IS EASIER

Remote control of sub-station equipment is easier and quicker than manual control. That is obvious. It is equally obvious that the cables connecting the control center with the switching equipment are a vital link in any remote control system. They must not fail.

We recommend Simplex - LATOX Control Cables with confidence that they will render satisfactory service. Our cable engineers and laboratories after careful study of service requirements developed these cables for this particular job. Simplex - LATOX Control Cables can be relied upon for uninterrupted, satisfactory performance.

Simplex - LATOX cables are small in diameter and light in weight so that they are easily handled for long or short runs. Their conductor insulation is the best type of rubber insulating compound at present available for control cables. LATOX insulation contains not less than 90% of pure, grainless, unmilled rubber and has to an unequalled degree those properties that make rubber the best available insulation for electrical conductors.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

Simplex – LATOX

Thin insulation made directly from rubber latex

LOAD BUILDING

Run Infra-Red Tunnel for 49 Cents an Hour

By DAVID AITKEN
Power Sales Division,
Cleveland Electric Illuminating Company,
Cleveland, Ohio

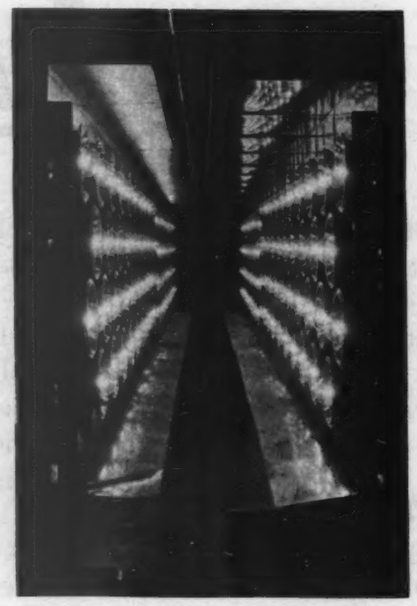
Typical of the startling results that are being attained in the power sales field through careful application of radiant heat to industrial drying problems is the case of the Steel Storage File Company. This company, located in the territory served by the Cleveland Electric Illuminating Company, has eliminated a production bottleneck and more than doubled its output with an infra-red, enamel-drying tunnel that cost $2,500 to install and 49 cents an hour to operate.

Before the tunnel was installed this company, which manufactures custom-made metal files for storing semi-active and inactive banking and utility records, had a production of about 800 units per day. Thirty minutes or more was required to dry the enamel finish by conventional methods. With the 38-kw. infra-red tunnel, which now dries units in six minutes, the plant is now capable of turning out 2,000 units per day.

To form the tunnel, shown, a vertical bank of 72 250-watt triangular-filament tungsten lamps in 9-in. Hall gold-plated reflectors, arranged in four horizontal rows of eighteen lamps each, was placed on each side of a continuous conveyor that carries parts through the tunnel at a speed of 3¾ ft. per minute. A small horizontal bank of eight lamps in 10-in. Fostoria reflectors was installed at the discharge end to dry the tops of the units.

Lamps in each of the vertical banks are spaced horizontally 15 in. apart, in rows that are staggered, and 9 in. apart vertically. And, so that every square inch of the surface to be dried will be subjected to the same amount of radiation, the horizontal rows are set at a pitch of 4 in. to 11 in.

A metal temperature of 325 deg. F. is secured with a density of 1.6 watts per sq.in. A synthetic baking enamel



INFRA-RED TUNNEL cuts enamel drying time from 30 to six minutes, using 16 kw. of connected load

of the alkyd resin type is used. To control the temperature one of the vertical banks is mounted on a rack and pinion so that its distance from the units as they pass through the tunnel may be adjusted. The usual distance from lamps to units is 7 to 8 in.

The product is carried through the tunnel suspended from a steel arm attached to a trolley load bar. Each trolley runs inside an inclined endless steel channel track to the discharge end of the tunnel and returns to the loading end by gravity. The conveyor, which has a length of 36 ft., extends sufficiently beyond the ends of the 23-ft. lamp bank to allow about two minutes to elapse at the loading end for volatiles to escape before entering the tunnel and a similar time at the discharge end for cooling.

To conserve energy, the conveyor is equipped with a cam-operated relay mechanism that shuts lamps off in sequence behind the last unit as it goes through the tunnel, if for any reason there is a delay in production. Similarly, the mechanism turns lamps on in sequence ahead of the first unit to go through after production is resumed.

The entire installation occupies a space 36 ft. long, 8 ft. wide and 7 ft. high, corresponding to a total floor space of 368 sq.ft.

•

Air Conditioning Equipment Upstairs

Because the weight of large-capacity air-conditioning compressors has been so greatly reduced, it was practical for the newly modernized J. J. Newbury Co. store at Texarkana, Texas, to install a 75-ton unit above the sales floor instead of using valuable basement floor space. This is one of the first installations of the newly developed, light-weight, Westinghouse 16-cylinder, hermetically sealed compressors.

All of the 9,000 sq.ft. first floor for the retail trade is air conditioned, the system having been installed during the remodeling of the two-story building. The air-conditioning load is 669,600 B.t.u., to provide 51 per cent

FILLING EMPTY SOCKETS!

THE LITTLE BULB THAT WASN'T THERE .... by GLUYAS WILLIAMS

1 ALAN WARD STOPS ON WAY HOME TO BUY 100 WATT BULB FOR FAVORITE READING LAMP

2 PUTS BULB IN LAMP BEFORE SUPPER, LOOKING FORWARD TO SESSION WITH NEW DETECTIVE MYSTERY

3 SUPPER OVER, SITS DOWN TO READ. FINDS WIFE HAS TAKEN BULB AND PUT IT IN KITCHEN

IN SELF DEFENSE, Mr. Ward then borrowed a 40-watt bulb from the hall, leaving the stairs in darkness. Later he went to bed with a headache, which he blamed on Mrs. Ward's baked beans.

Is "bulbsnatching" a menace in your home? You can end it by getting enough G-E MAZDA lamps so each reading lamp can have at least 100 watts, well-shaded.

TYPICAL OF G-E ADS appearing in national magazines this summer and fall is this Gluyas Williams "comic strip" sequence. Ads like this are getting phenominally high reading for General Electric's "bulb-snatching" story. *That means filling empty sockets for you!*

G-E MAZDA LAMPS

GENERAL ELECTRIC

LIGHT WEIGHT and precision balancing make practical the use of this air-conditioning unit on the second floor of a chain store. The small size of the 75-ton hermetically sealed unit is largely the result of using refrigerant gas to cool the built-in driving motor. The refrigerant suction line enters the motor end bell at the right as shown

relative humidity and 80 deg. F. dry bulb inside the store, with 100 deg. F. dry bulb and 80 deg. F. wet bulb weather outside.

The machine room is above the sales floor in an unused portion of the second-story warehouse. In it is the 75-hp., 208-volt, three-phase, 60-cycle, hermetically sealed compressor and automatic reduced voltage starter, the air-conditioning unit with a 7½-hp. blower and main control board. An evaporative condenser is on the roof directly above.

Power from a V-16-cylinder, hermetically sealed air-conditioning compressor is more efficient than previous totally inclosed designs as a result of seven years development of reed type valves and Freon gas manifolds to reduce friction losses. Other engineering advantages that led to its use include refrigerant cooling for the motor, sealed-in lubrication and a reversible oil pump to prevent harm should the phases be inadvertently reversed on the electric power system.

The air-conditioning unit consists of a built-up heavy gage sheet metal casing and houses the 31 sq. ft. evaporator coil and 25 standard filters and the casing has a cross-section 9 x 9 ft. and is provided with two walk-in doors. Condensate from the evaporator coil is carried away by an insulated copper drip pan. Provision has been made in the air-conditioning unit for the future installation of a steam-heating coil. The entire unit is insulated with 1-in. cork finished off with asbestos cement.

A simple foundation is used. The compressor is mounted on a 12-in. concrete block and isolated by specially designed rubber pads, the block being isolated from the machine room floor by 2 in. of machinery cork. The blower is mounted on a 6-in. concrete block and isolated by six rubber dampers and the evaporative condenser is supported by two 10-in. I-beams which span the parapet wall on the roof. Compressor, evaporative condenser, coil, line strainer, receiver and sight glass are connected by type K copper pipe and the low side is connected to the compressor by a 4-in. insulated copper suction line.

The entire installation is under automatic control, including automatic protective devices. After depressing the starting button, the various devices float on and off the line in methodical sequence in response to the thermostatic control unit and continue to do so until de-energized by the starting button.

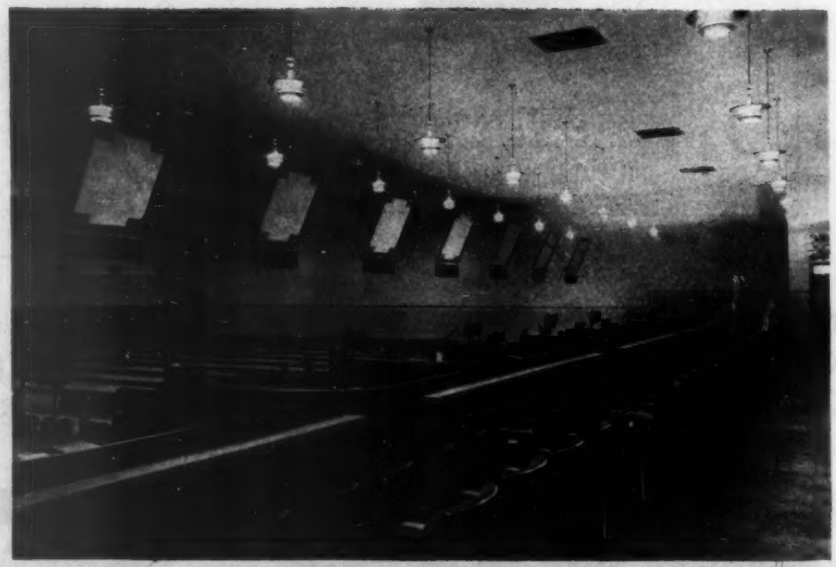
•

Bowling Alley Pins Use 55 Ft.-Candles

Quickened interest of southern Californians in bowling has resulted in a number of new alleys in the Los Angeles area. Fine playing conditions in one of these, the Southeast Bowling Center, Huntington Park, is possible because of excellent lighting.

Plenty of glare-free light, free from shadows, is supplied on the sixteen alleys by 48 X-ray reflector units using 300-watt lamps. Illumination is intensified to about 55 ft.-candles over the pins by sixteen Ivanhoe direct-type units using 300-watt lamps. General illumination on the aisles and the cafe section is taken care of by sixteen Beverly direct-lighting units also using 300-watt lamps. All units are of the suspension type. Total demand is 26 kw.

An electrical scoring system is another feature. A 250-watt stereopticon type lamp projects the score upon a large screen. This is written on a transparent sheet at the desk near the player.



TWENTY-SIX KW. of lighting load is utilized by Southern California bowling alley. Three-hundred watt units used throughout. Stereopticon lamps at each alley project score on large wall screen

For the good of your heating load...
we are addressing this series of ads to Electrical Dealers

WOMEN WILL TALK

When women are enthusiastically pleased with some recent purchase, they tell about it—indeed they do! . . . So, when you sell them a toaster or iron, say, that has Chromel elements—pretty soon they're telling others what a swell purchase they've made. And as the years move on, the device continues to give good, uninterrupted service, because the Chromel element lasts and lasts. The device maker, in using Chromel, thereby does all that he can do to give you the utmost in worthy merchandise. Thus, you have pleased customers who are your best advertisements. Women will talk, and say good things of your store, when you sell them Chromel equipped devices. . . . Hoskins Manufacturing Co., Detroit, Mich.

Chromel

CHROMEL

ELECTRICAL HEATING ELEMENT

WIRE

USED IN MILLIONS OF APPLIANCES

NEW EQUIPMENT

Nine-In. Fluorescent Lamp

Applications of this new lamp are for fluorescent lighting in cabins of airliners and ships at sea. It may be used in Pull-

Six-watt, tubular, 9-in. fluorescent lamp, about the thickness of a man's finger, has been added to the company's Mazda "F" lamps. **Westinghouse Electric & Mfg. Co.**, Lamp Division, Bloomfield, N. J.

man berths, over business machines and in curved showcases and coves, etc. This baby lamp is available in daylight and white colors.

•

Reflector Coating

Reflector coating for fluorescent lighting to convert certain radiations emitted by the lamp into the red desired; known as No. 2626 Red Color Corrective Lacquer. **Continental Lithograph Corp.**, Cleveland, Ohio.

Absorbing the near ultra-violet yellow and green radiations abundant in the emission from the fluorescent lamp, this coating alters wave-lengths and re-emits much of the energy as red light, states the company. It thus makes it useful for showcase lighting, especially in meat markets in order to give the correct color for meat. It is claimed that this is done with comparatively little loss of energy.

•

Ground Detectors

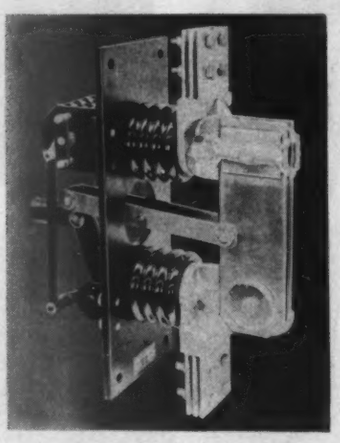
"Flex-A-Plugs" for indicating grounded-phases on Flex-A-Power runs. **Trumbull Electric Mfg. Co.**, Plainville, Conn.

Having been installed on each of the branch circuits, this indicator will give immediate visual indication of grounds occurring on any one or all phases at any point between the ground detector plug and current-consuming equipment, it is claimed. When there are no grounds the three Neon pilot lamps glow softly. When a ground occurs on any one phase (of three-phase, three-wire, 250 volts or 440 volts a.c. circuit) the lamp on that phase goes out. If all phases are grounded all lamps go out.

•

Contact Switch

A completely inclosed four-stage type "M" auxiliary switch, it may be used for signaling and lamp indication, the auxili-



7.5-kv., 2,500-amp. switch, type "M," for signaling and lamp indication. **Delta-Star Electric Co.**, Chicago, Ill.

ary switch being linked to the operating mechanism of the main switch. Although shown single pole, three such units can be arranged for group operation. The main switch is of the slotted tongue construction with full floating blades and adjustable line pressure contacts; hinge is of the annular ring line pressure design.

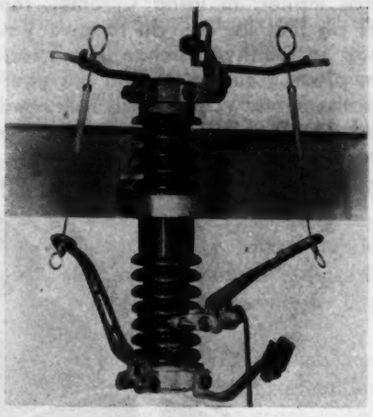
Who Makes What?

"Electrical Buyers Reference," published annually. **Electrical World**, 330 West 42d St., New York, N. Y.

Names, addresses and products of electrical manufacturers are catalogued in this convenient, annual publication for public utility, industrial, engineering and other major electrical buying interests.

Reclosers

These "Protectolink" reclosers are similar in design to the cutouts described in ELECTRICAL WORLD, August 10, 1940, ex-



Protectolink reclosers for pole or crossarm mounting. **W. N. Matthews Corp.**, St. Louis, Mo.

cept that two sets of operating arms are installed so that two Protectolink fuse links may be installed for two-shot reclosing operation. It is claimed that after the first fuse link melts the circuit is reclosed in one cycle. If more time-delay is desired they can be furnished with a mechanism that will retard the reclosure 40 to 50 cycles.

•

Push-Button Stations

A new line of one- and two-button standard-duty push-button stations. **General Electric Co.**, Schenectady, N. Y.

These new push-button stations are similar in appearance to the heavy-duty stations made by this company. They are 4 1/16 in. high, 2 5/8 in. wide and 2 1/2 in. deep. Mounting holes are in the upper left-hand and lower right-hand corners.

•

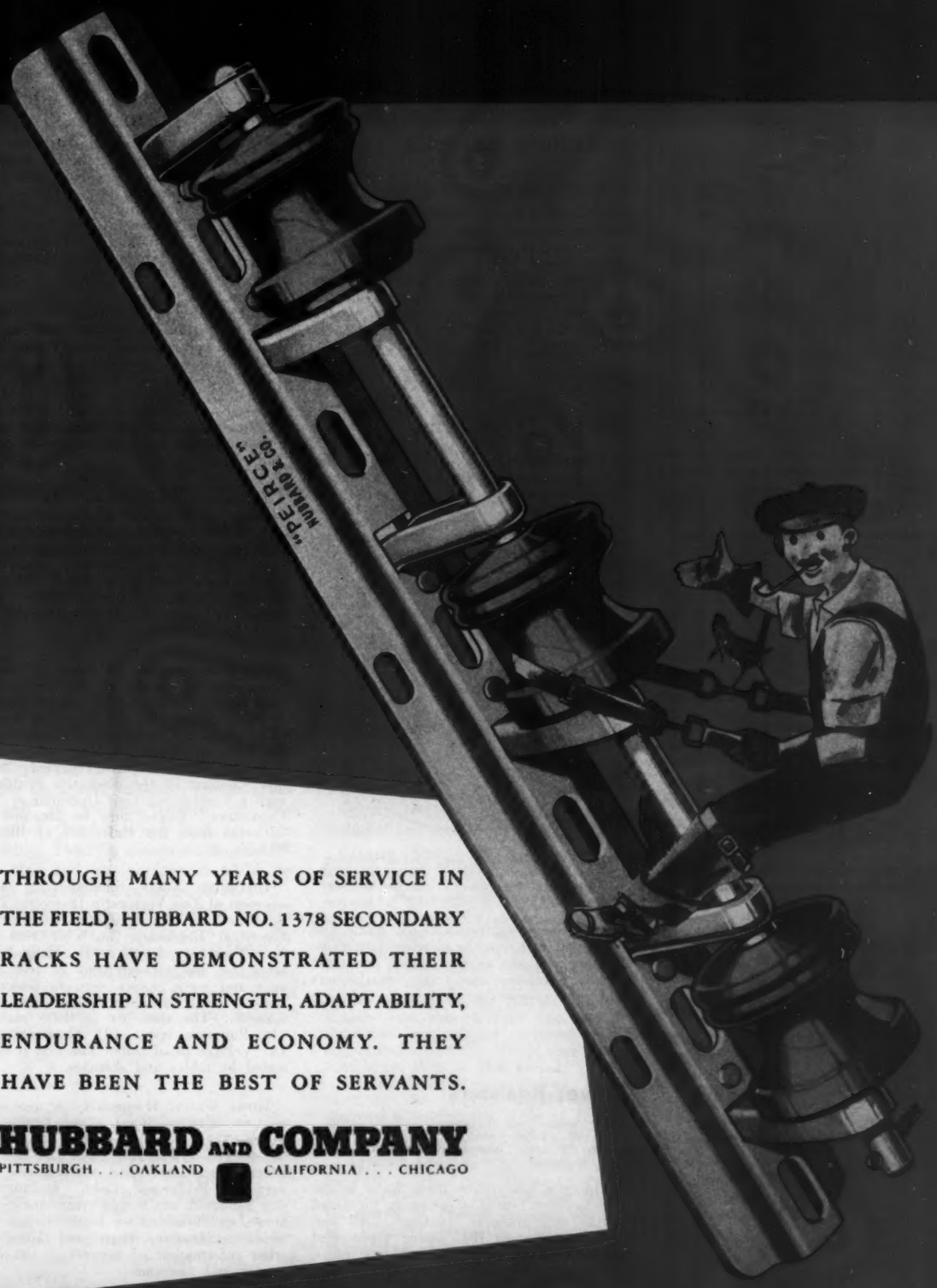
Ball Dropper

A new ball dropper which holds 45 steel balls for the bearings of watt-hour meters. **The States Co.**, Hartford, Conn.

The transparent plastics material of which the dropper is made is said to afford visibility of the balls in the chamber of

"TO BE A GOOD LEADER-

ONE MUST FIRST HAVE BEEN A GOOD SERVANT"



THROUGH MANY YEARS OF SERVICE IN THE FIELD, HUBBARD NO. 1378 SECONDARY RACKS HAVE DEMONSTRATED THEIR LEADERSHIP IN STRENGTH, ADAPTABILITY, ENDURANCE AND ECONOMY. THEY HAVE BEEN THE BEST OF SERVANTS.

HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND CALIFORNIA . . . CHICAGO

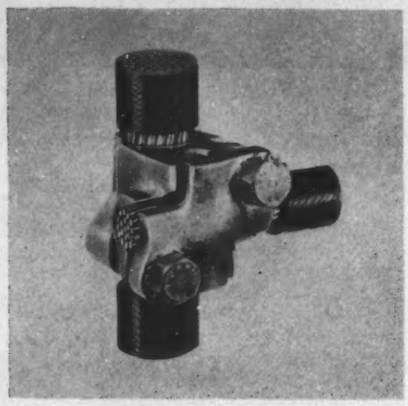
"HANG THE LOAD ON HUBBARD HARDWARE"

the dropper. It is designed to eject a single ball into the cup of the meter bearing; a cap keeps out the dust. The dropper is held directly over the jewel cup so that it need not be handled by the operator.

•

Connector

Uses of this connector are as a parallel tap, a T-connector, a cross-connector or as an end-to-end connector, and it is said



"Versitap" type QPX connector, in ten sizes to accommodate cables from No. 8 to 1,000,000 circ. mil. **Burndy Engineering Co., Inc.**, New York, N. Y.

that it will clamp a large range and combination of cable sizes in either the main or branch connection grooves. It may be taped and is installed with an ordinary wrench. This connector is especially suitable for use in industrial and building wiring.

•

Fire Extinguisher

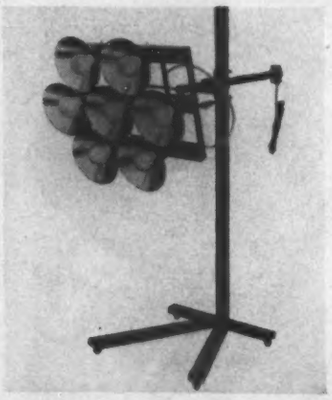
Pistol-grip carbon dioxide fire extinguisher, for use with electrical fires. **Walter Kidde & Company, Inc.**, New York, N. Y.

A 16-in. high, trigger-operated extinguisher for electrical fires without fear of grounding. It is recommended for laboratory fires or fires in electrical equipment or small quantities of flammable liquids.

•

Infra-Red Units

Units are both adaptable to horizontal and perpendicular adjustment, as well as



New portable infra-red baking and drying units, model P-7-IR (shown) and model P-1-KM. **Fostoria Pressed Steel Corp.**, Fostoria, Ohio.

directional adjustment of the reflector group. The bank of the 7 Para-Sphere reflectors will handle areas up to approximately 30 in. in diameter and can be adjusted to a height of from 18 in. to 6 ft. The P-1-KM unit concentrates its energy over a 10-in. circle with the same height requirements as the other unit. The P-7-IR units may be used for drying and baking "touch-up" work and for dehydration of stacks of paper in printing plants, the model P-1-KM being used in doctors' offices and garages for thawing radiators and softening grease in transmission and differential cases.

•

Auxiliary Actuator

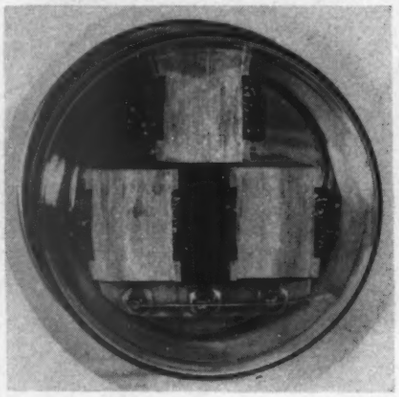
Type W spring leaf and roller actuator. **Mu-Switch Corp.**, Canton, Mass.

The new style actuator comprises a strong phosphor bronze-leaf spring riveted at one end to the switch cover and having its free end a U-bracket which holds a ⅜ x ¼-in. roller made of graphite-impregnated, canvas-base bakelite. It is said that the self-lubricating roller on spring leaf adapts the switch to high-speed cam operation.

•

Socket Transformers

Expanding the socket-type metering idea, this company is bringing out a line of small transformers adapted to socket-type watt-hour meters. Available types include



Three-phase, four-wire wye reactive metering transformer with switch, 115, 230 or 460 volts; illustrative of line announced by **Sparkes Mfg. Co.**, 318 Jefferson St., Newark, N. J.

reactive metering transformers, single and double adapter types to accommodate transformers and one or two meters in single socket positions, small tap transformers and copper-oxide rectifiers.

•

Power Resistors

A complete line of commercially non-inductive IRC power wire-wound resistors, from 10 to 200 watts. **International Resistance Co.**, 401 N. Broad St., Philadelphia, Pa.

The new feature of these units is the Ayrton-Perry type of winding as compared to the multiple-layer windings. All features of standard IRC power wire-wound resistors are claimed for these new units, including any type of mounting.

TECHNICAL LITERATURE

SAFETY RULES — National Bureau of Standards Handbook H31, superseding H6, gives safety rules for the installation and maintenance of electrical supply stations. It is comprised of Part I and the grounding rules of the Fifth Edition, National Electrical Safety Code. Also cited are protective arrangements of stations and substations and of equipment. The different types of equipments needed are also described. Copies may be obtained by writing the Superintendent of Documents, Washington, D. C., at 10 cents a copy.

ACCIDENTS—The National Safety Council annual statistical report on accident rates in the public utility industries for 1939 shows, among other things, the predominant causes of these accidents and which companies made the best records. Comparisons of the utility rates with other industries are shown in graph form. Pamphlets may be obtained for 20 cents a copy from the National Safety Council, 20 North Wacker Drive, Chicago.

ROLLED STEEL WASHERS — Suggestions for specifications for rolled steel washers is offered and approved by the transmission and distribution committee of the Edison Electric Institute, 420 Lexington Ave., New York City. Specified as Bulletin TD-10, it supersedes four specifications of N.E.L.A. It cites scope, general information, material, kind, dimensions and tables for round and square washers.

DIELECTRIC ABSORPTION — An 11-page booklet on dielectric absorption and the new technique in testing electrical insulation gives the general procedure for the tests and typical dielectric absorption curves made with motor-driven "Megger" insulation testers. Bulletin 1660 is published by James G. Biddle Co., 1211-13 Arch St., Philadelphia, Pa.

AIR CONDITIONING—A report of an investigation conducted by the engineering experiment station, University of Illinois, in co-operation with the American Society of Heating and Ventilating Engineers and the National Warm-Air Heating and Air-Conditioning Association entitled "Summer Cooling in the Research Residence with a Condensing Unit Operated at Two Capacitors." Copies may be obtained for 75 cents from the University of Illinois, Urbana, Ill.

DIELECTRIC TESTS—Standards for Measurement of Test Voltage in Dielectric Tests published by the American Institute of Electrical Engineers, 33 West 39th St., New York City, for 40 cents. Methods are given for the measurement of test voltages and wave shapes used in dielectric tests of electrical apparatus or insulating material. The tests are in three classes: (1) Puncture tests. (2) Flashover test. (3) Voltage proof tests. The text is illustrated by tables and sketches.

HOME WIRING HANDBOOK—A new manual on modern home wiring practices, called "G-E Home Wiring Handbook" (51-4014), is available from the General Electric appliance and merchandise department, Bridgeport, Conn. Included in this handbook are wiring requirements for home, specifications for home wiring, material specifications, charts and tables and other information of interest to the contractor and consumer.

MANUFACTURING - MARKETS

Westinghouse Shows Gain in Net Profit

Net profit of Westinghouse Electric & Manufacturing Co. for the first seven months this year totaled $11,592,448 after charges and taxes, as against $7,112,628 in the same period last year. Net profit for the quarter ended July 31 was $5,036,889, against $3,546,186 in the same 1939 period.

Earnings for July soared over a year ago, totaling $1,755,436, against $773,841. On the basis of present rate of business this trend is expected to continue for some time.

Employees for August will receive a wage adjustment bonus of 11 per cent, as against 14 per cent in July, 8 per cent in August, 1939, and 1 per cent in August, 1938.

•

Vacuum Cleaner Sales Hit New High for June

Repeating their performance of May, when household vacuum cleaners established an all-time record for that month, sales hit a new high for June, totaling 144,237, compared to 173,896 in May and an increase of 44.74 per cent over 99,674 in June, 1939.

January-June sales totaled 931,012, an increase of 28.25 per cent over 706,353 in the first half-year of 1939, according to industry figures announced by C. G. Frantz, executive secretary of the Vacuum Cleaner Manufacturers Association.

•

Board Lets Contracts

Tacoma, Wash., board of contracts and awards has let contracts as follows: Three 1,500-kva. transformers to Allis-Chalmers Manufacturing Co., for $11,202 net; steel structure, tideflats substation, fabricate and erect, Western Ornamental Iron Works, Tacoma, $13,154; 32,000 lb. of aluminum cable for Bonneville intertie line, Aluminum Co. of America, $7,083.

•

Manufacturers Issue Earnings Reports

In a recent letter to the stockholders of the York Ice Machinery Corp. President Stewart E. Lauer reported that orders booked during the nine months ended June 30 totaled $12,560,931, against $11,396,429 in the similar period last year. He also reported for the same period a total of $8,589,596 sales completed, against $7,876,752 for the similar period last year. Mr. Lauer reported an operating improvement of $786,000 at the end of the third quarter, but stated that this figure should not be confused with net profits. "We anticipate no improvement in operations during the fourth quarter this year over last year, but believe the improvement now held can be maintained."

Other manufacturers reporting profits included the following:

CARRIER CORP.—Net income for six months ended June 30 of $278,698, or 71 cents a common share, compared with net income of $147,642, or 38 cents a share, in the similar 1939 period. Completed sales for the period were 7.1 per cent below those in the first half of last year. Unfilled orders on June 30 were $4,504,023, compared with $3,275,701 a year earlier. Orders booked in the six months were slightly less than a year ago, but the trend has been upward in recent months and second quarter bookings were 3.6 per cent larger than in 1939 period.

STEWART-WARNER — Including subsidiaries, for the first six months of 1940, reported a surplus net profit of $677,245, after provision of $262,201 for federal and Canadian income taxes. This is an increase of $476,984 over the corresponding period for 1939, at which time net profit of $200,261 was reported. Earnings for the first six months of 1940 of 54 cents per share on 1,243,063 shares of common stock outstanding, includes a dividend of 25 cents.

Refrigerator Sales at Peak; Ranges Up

Domestic sales of household electric refrigerators in the first six months of 1940 set an all-time high, totaling 1,737,548 units, an increase of 32.1 per cent over the same period of last year and of 9.5 per cent over the first six months of 1937, the previous record period.

Sales in June amounted to 305,943 units, a seasonal decrease from the 1940 record month of May amounting to 14.7 per cent, but an increase of 22.3 per cent over June a year ago, as reported by the National Electrical Manufacturers Association. World sales for the first six months of 1940 were 1,828,047, as against 1,410,002 in the same period a year ago, a gain of 29.6 per cent.

Electric range sales in the first six months, as reported by N.E.M.A., numbered 228,730 units. While this was not a record, it was an increase of 34.2 per cent over the corresponding period of last year. Sales in June numbered 33,403 units, a seasonal drop from the 1940 record month of May amounting to 22.3 per cent, but an increase of 22.5 per cent over June, 1939.

•

Washer Shipments in Seasonal Dip

Household washer shipments in June were fourth highest in the industry's history for that month, aggregating 112,134, a drop of 6.61 per cent from 120,076 reported for June, 1939, and the usual seasonal decrease from May, when shipments totaled 118,987, according to industry figures announced by Joseph R. Bohnen, executive secretary-treasurer of the American Washer and Ironer Manufacturers' Association.

Shipments for the six-month period

totaled 777,576, the industry's third largest first half-year and an increase of 5.93 per cent over 734,060 reported for the same period in 1939.

Ironer shipments showed increases for both periods, 8,571 in June, compared to 8,317 a year ago, an advance of 3.05 per cent, and 63,749 in the half-year, against 61,121 in the corresponding months of 1939, a gain of 4.30 per cent.

•

Electric Furnace Maker in New Quarters

C. I. Hayes, Inc., manufacturer of industrial electric heating equipment at Providence, R. I., has moved his plant from 129 to 75 Baker Street in that city, where an immediate increase of about 50 per cent in production space is being utilized. The new quarters comprise a one-story modern manufacturing building, with improved facilities for demonstrating electric furnaces and other equipment.

Four furnaces can now be shown in operation simultaneously when required, compared with two at the previous plant. The new office arrangements are modernized and electric service has been increased in capacity. The new quarters include about 10,000 sq.ft. of production area and a stores building of 2,000 sq.ft. floor area is now under construction on the property. Provision for further expansion of the plant is available on the premises.

•

General Electric Bonus

Employees of the Pittsfield, Mass., plant of General Electric Co. received $161,000 as their share of a nation-wide company disbursement of $2,000,000 under a profit-sharing plan. The amount distributed covered profits for the first six months of the year.

•

Bakelite Moves Offices

New York offices of Bakelite Corp. have been moved from 247 Park Avenue to 30 East 42d St.

New York Metal Prices

	Aug. 20, '40 Cents per Pound	Aug. 14, '40 Cents per Pound
Copper, electrolytic	11.00*	10.75*
Lead, A. S. & R. price	4.75	4.75
Antimony	14.00	14.00
Nickel, Ingot	35.00	35.00
Zinc, Spot	6.87	6.64
Tin, Straits	50.75	51.00
Aluminum, 99 per cent	18.00	18.00

*Delivered Connecticut Valley.

Field Reports on Business

A sharp expansion in industrial activity is anticipated during coming months as defense orders speed into production. Electrical manufacturers are well stocked with orders to last many months. Utilities report continued upward trend in power load and earnings. Merchandise drives are under way.

NEW YORK

Uncertainty over the final contents of several bills pending in Congress has resulted in some slowing down in forward orders. New business, in some instances, is being held up, pending final passage of the tax bill. This applies also to some plant expansion to provide productive facilities for defense orders.

Electrical manufacturers have stepped up production schedules and have sizable backlogs to carry for many months. Efforts are being made to prevent delay in deliveries of necessary defense equipment. Many utilities are placing generating equipment orders for 1941 and 1942 delivery and there is under consideration 1943 delivery.

Engineering News-Record reported construction awards for last week 41 per cent lower than the preceding week and 26 per cent lower than a year ago. However, the total for the 33-week period was 1 per cent above the 1939 period. Encouraging was the 21 per cent increase in private awards over 1939.

While there has been a slight decline in some lines, others have shown an increase. Retail trade is reported higher in many sections. Opinion is that once the defense orders get under way on a large scale business in general will show a sharp upturn from present levels.

In the Pittsburgh district business moved sharply higher after showing only minor gains during recent weeks, according to the Bureau of Business Research, University of Pittsburgh. The university's index has reached the highest level since the middle of January and is now only 8.5 points below the peak at the end of November, 1939.

PACIFIC COAST

California employment has just surpassed its recent peak of mid-1937 and is now 22 per cent over last year. Defense industries lead, while electric utilities, usually constant, are up 5 per cent. July building permits in the seven Western states exceeded those of June by 25 per cent, and were 50 per cent over those of last July. Private building is still increasing, the typical region of northern California having averaged 60 FHA homes per day all year. Areas close to defense work are receiving special attention.

Outstanding general contracts awarded include $30,870,000 for aviation facilities at Pearl Harbor and the Pacific Clipper Ship Islands; $11,050,000 for Canal Zone buildings and barracks; $2,731,000 for Camp Ord, Monterey, Calif. Many earlier general awards are now in electrical stage, including $168,397 for electric alarm and distribution system at Puget Sound, Wash.; $118,786 for street lighting and electric distribution at Hillfield, Ogden, and $209,340 for turbine and motor-driven pumps at Pearl Harbor, all of which are reflected in lengthy bids presented to wholesalers.

Beyond some smaller additions, such as $45,000 extra for the $700,000 northeastern California system of 433 miles and 979 members, REA work is concentrated in Washington and Oregon, where approximately $7,000,000 of new work is being mapped. Los Angeles business has included $34,332 electric machinery for a water plant and $84,000 of lead, weatherproof and varnished cambric cables. General Electric submitted low bid at $700,000 for one 82,500-kva. generator for Boulder plant. Table appliance sales in most large coast and interior cities are exceeding those of 1938 by 25 per cent, and advance holiday bookings maintain this average.

NEW ENGLAND

TVA has purchased here two 60,000-hp. G. E. steam turbine units and two B&W boilers of 600,000-lb.-per-hour steam capacity operating at 850 lb. per sq.in. and 900 deg. These units will be installed at Watts Bar, Tenn. General Electric recently sold a 6,000-kw. steam turbo-generator unit to a Midwest chemical company. Connecticut industries are operating at high gear and are using from 65 to 140 per cent more power as compared with a year ago, due to third shift production as the result of stepping up the defense program. One Connecticut plant has bought twelve 333-kva. transformers; another has purchased 50 floodlights of 500-150 watts rating, and has ordered four 1,000-kva. transformers for additional purchased power supply.

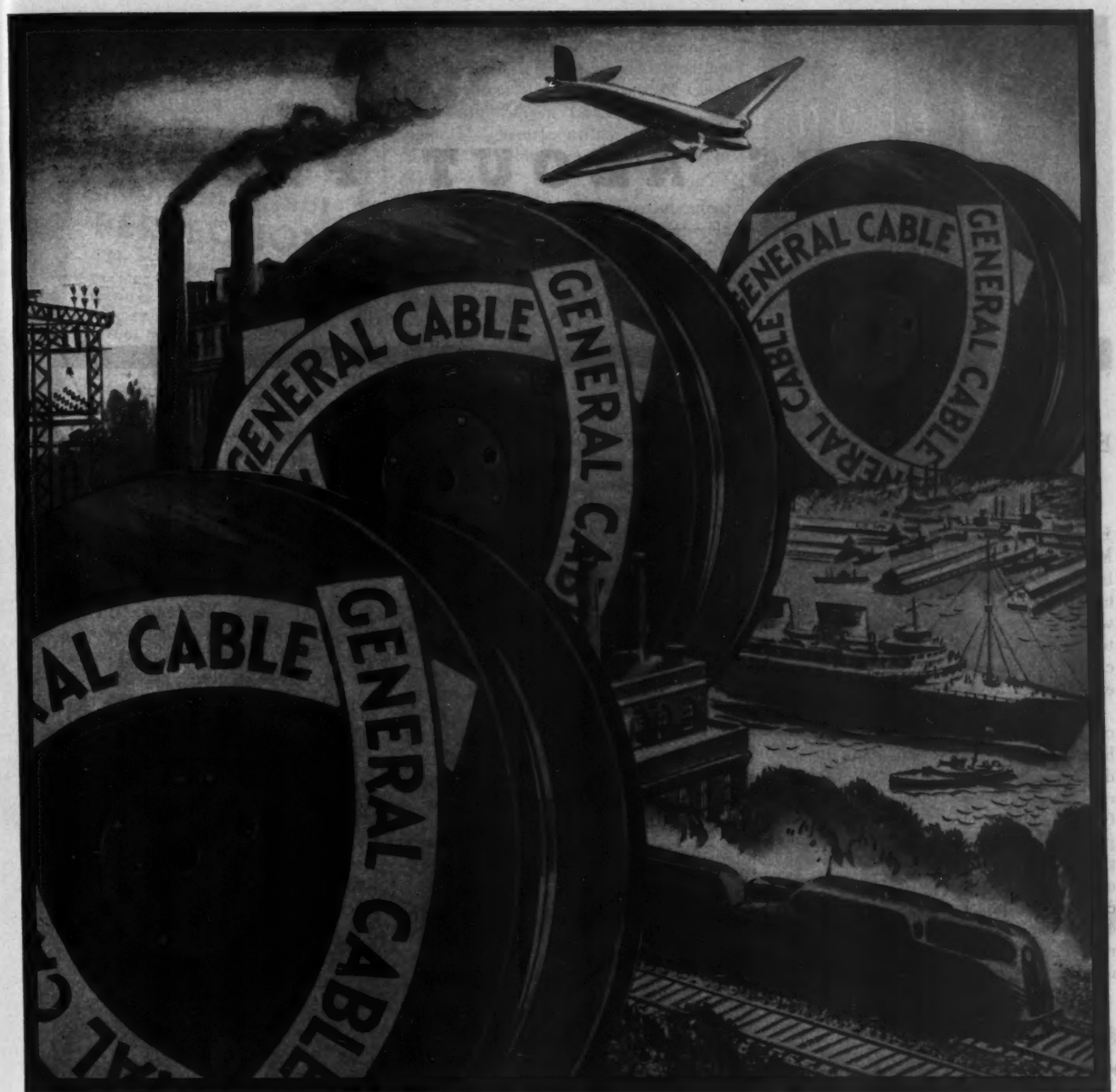
Contracts for electric cable received by Collyer Insulated Wire Co., Pawtucket, R. I., during the past week total $287,609. Small motor sales are steady in Massachusetts, where machine tool builders are operating to full plant capacities. Air-conditioning installations reveal a marked increase in interest and buying.

Appliance sales in this district are very encouraging; calls for refrigerators are in good volume in the Vermont district; 151 units were sold during one week a fortnight ago and 44 ranges were booked during the same period by the same group of central stations. Commercial cooking apparatus is selling well in Massachusetts.

CHICAGO

Progress toward the great objective of swinging the national defense program into high gear marked the week's developments on the industrial front. Local manufacturers were awarded contracts last week totaling $690,000 in addition to the $5,715,430 previously awarded. Equipment ordered included refrigeration plants, radio apparatus, telephone equipment, steel conduit and milling machines. Seven other defense contracts awarded to firms in this area mounted to $11,487,546 for trucks, motors, electric welders and machine tools.

Steel mills in this district reflected increased demand by raising production to 97 per cent of capacity. Central plant air-conditioning systems installed during July numbered 37 with a capacity of 415 hp., as compared with 33 installations, totaling 375 hp. in the same month last year. Dealers sold 337 electric room coolers last month. Four 1½-ton electric hoists will be installed at the Roseland pumping station. Fourteen sizable store and office remodeling jobs started last week include installation of 1,139 circuits, 1,623 lights, 1,511 receptacles and 231 motors totaling 874 hp. Manufacturers report a heavy demand for fluorescent lighting equipment.



Already Prepared

Anticipating the greater production that is sure to come with industrial preparedness, it is assuring to know that General Cable is already prepared to meet the increasing demand for quality wires and cables.

GENERAL CABLE

BARE and INSULATED WIRES and CABLES for EVERY ELECTRICAL PURPOSE

General Cable Corporation Sales Offices: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT KANSAS CITY (MO.) • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROME (N.Y.) • ST. LOUIS • SAN FRANCISCO • SEATTLE • WASHINGTON (D.C.)

NEWS ABOUT PEOPLE

Eureka Announces New Executive Appointments

George T. Stevens has joined the Eureka Vacuum Cleaner Co., Detroit, Mich., in the capacity of vice-president in charge of sales, resigning to accept his new position from the Crosley Corp., where he was manager of the refrigerator division. Mr. Stevens has to his credit a broad background of experience in the household appliance field.

V. E. Carlson has been appointed chief engineer of the company. He has devoted the past ten years to the design and development of vacuum cleaners with the Hoover Co., North Canton, Ohio. He has held various positions in the engineering division there and was staff engineer at the time of his resignation. His duties have covered all phases of design and coordination of the activities of the laboratories and production department on new cleaner developments.

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▶ CRAIG HAMPTON has been appointed superintendent of maintenance at Copperweld Steel Co.'s new plant at Warren, Ohio. Mr. Hampton was previously connected with the steel and tube division of Timken Roller Bearing Co.

▶ GEORGE H. MEILINGER has been appointed sales development manager of household refrigeration in the newly created household refrigeration and laundry equipment department of the Westinghouse merchandising division, Mansfield, Ohio. Formerly refrigeration supervisor in Chicago, Mr. Meilinger will be responsible for development of household refrigeration sales under the new set-up. He succeeds H. M. BUTZLOFF, resigned. L. L. SHAWBER, manager of the laundry equipment department until it was combined recently with the household refrigeration department, will become laundry equipment product supervisor in the new department. S. G. FISHER, formerly in the dishwasher sales department, will become sales development manager on laundry equipment.

•

Dallas Power Elects Moore Vice-President

Walter G. Moore, one of Texas' best known electric utility men, was recently elected a director and vice-president of the Dallas Power & Light Co. Mr. Moore will have charge of the commercial phases of the company's operations. He joined the executive department of the Dallas utility recently after resigning as vice-president of the Texas Power & Light Co., in charge of commercial and industrial sales.

A native of Paris, Tex., and a graduate of Texas A. & M. College, he took an apprenticeship course with the Westinghouse Electric & Manufacturing Co. After spending several years with electrical supply and contracting firms, he became manager for the Texas Power & Light Co. at Paris in 1913. In 1916 he entered other work, but in 1925 he again became the Texas Power & Light manager at Paris. In 1927 Mr. Moore went to Dallas as assistant commercial manager of the Texas Power & Light Co. and in 1928 he became commercial manager. In 1937 he was made a director and vice-president.

Mr. Moore is a past-president of the Petroleum Electric Power Association; served two years as chairman of the commercial section, southwest division of the old National Electric Light Association, and was chairman for two years of the air conditioning committee of the sales section of the Edison Electric Institute.

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▶ COL. L. B. LENT, engineer and inventor, has been appointed executive secretary of the American Engineering Council to succeed FREDERICK M. FEIKER, who resigned several months ago to become dean of engineering at George Washington University.

▶ EDWARD C. KELLY, Medford and Portland attorney, has been named assistant general counsel for the Bonneville Power Administration. He succeeds WILLIAM T. MARTIN, who has resigned to enter the private practice of law in New York City. Mr. Martin, former Tennessee Valley Authority attorney, has been a member of the Bonneville staff since May, 1939. Mr. Kelly is a graduate of the University of Oregon law school and has been a member of the Oregon bar since 1927.

▶ ROSCOE E. BAILEY, manager of Utah Power & Light Co.'s Park City division for fourteen years, has been appointed manager of the southern division. He succeeds George L. Ellerbeck, recently placed in charge of the Ogden division. Mr. Bailey is a veteran power company employee, having worked up through the ranks since he joined the company as power salesman in 1914. The following year he was promoted to superintendent of power sales and advanced to assistant to commercial manager in 1924. A native of Illinois, he gradu-

You Can't Beat
PERFECTION
The speed, efficiency and perfect balance of this Perfection Post Hole Digger makes it an outstanding value. Blade and shank forged in one piece from high carbon steel, heat treated for extra toughness, takes and holds a keen cutting edge. Special design handles. Square in shape, with extra strength at head, tapering to nicely rounded, hand-fitting upper section. Marked with foot measurements to show depth of hole at a glance. Hardened steel bolts in handle and at pivot will not shear off. For greater service life—and extra value, specify
STURDETOOLS
a TRUE TEMPER PRODUCT
Heavy Duty Perfection Post Hole Digger. Blades—11 gauge heat treated high carbon steel—size 12" long, 7" wide, with sanded and lacquered handles either 7 or 8 ft. long—weight about 12 lbs.
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20 North Wacker Drive • Chicago, Illinois
Branches and Warehouses with Complete Stocks in Principal Cities of the United States

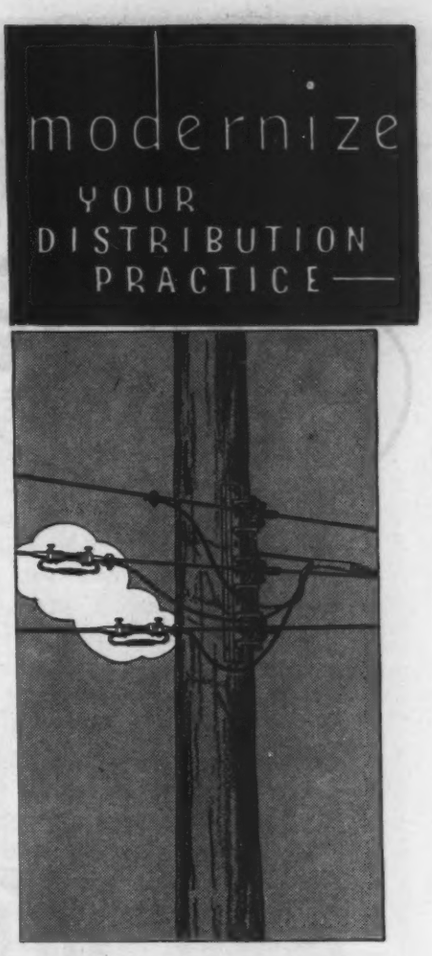
ated from the state university engineering school and completed his education at the central station institute of Commonwealth Edison Co., Chicago. He began his electric utility career with the Illinois Northern Utilities Co. in 1914.

► FLOYD STROUP is now superintendent of the melt department of Copperweld Steel Co.'s new plant at Warren, Ohio. Mr. Stroup has previously been connected with American Steel Foundries, Central Alloy Steel Co., Republic Steel Corp., Republic Research Co., Timken Roller Bearing Co., United Engineering & Foundry Co., and Aetna Standard Engineering Co.

► ROBERT E. LOVEJOY, formerly manager of the electric light department of Lunenburg, Mass., and lately general line foreman of the Fitchburg (Mass.) Gas & Electric Light Co., has been appointed superintendent of electric distribution for the latter, succeeding the late Frank D. Powers.

► IVAN JACKS, formerly of Lebanon, Ind., has been appointed superintendent of the Jasper, Ind., municipal light and water plant, succeeding Byron Adkins. Mr. Jacks is a graduate of the University of Tennessee. He held a position in the engineering department of the Uhlen Construction Co. of Lebanon for 22 years, and for three years was assistant chief engineer of the Indiana Public Service Commission. For twelve years Mr. Jacks was engaged in engineering work in South America and Europe, where he was employed in the work of constructing and operating power, water, filtration and sewage disposal plants. The countries in which he worked are Bolivia and Uruguay, Poland, Russia, Austria, Italy and Spain.

► W. H. MILTON, JR., who has been sales manager for the General Electric plastics department at Pittsfield, Mass., for the past two years, has been appointed assistant manager, responsible to G. H. Shill, manager, for all phases of the department's activities. A native of Roanoke, Va., and a graduate of Virginia Military Institute, Mr. Milton has been associated with General Electric since 1920, when he became a member of the company's student engineering course at Schenectady. On completing the course he became a member of the industrial department in 1922, and as an inside-mine electrician was loaned to the Glen Alden Coal Co., Scranton, Pa., shortly afterward. In 1925 he returned to the company's Philadelphia office as a mining specialist, and in 1933 was assigned to follow the chemical and rayon industry in that area. He became manager of sales of the G.E. plastics department in 1938.

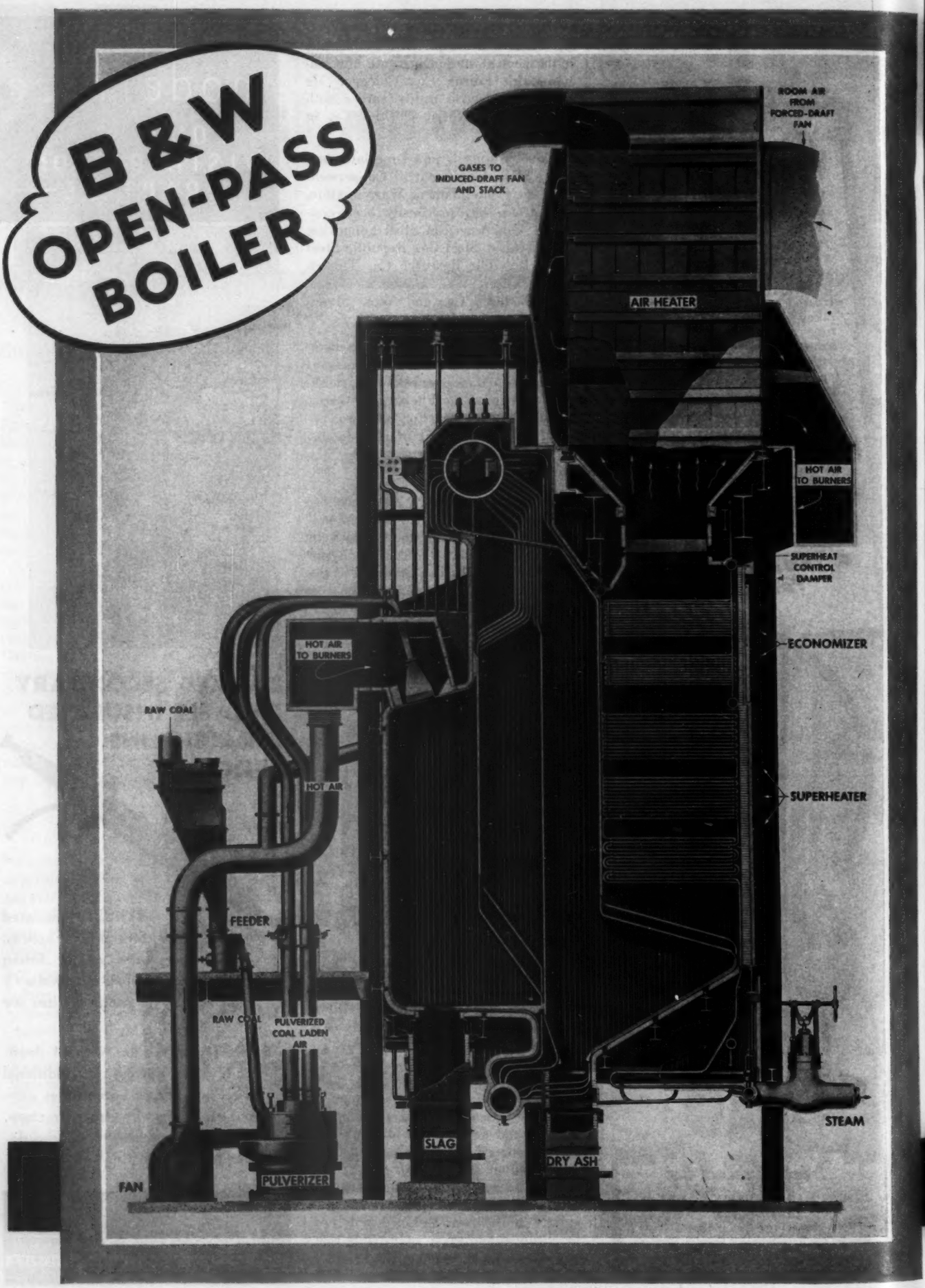


BANKED SECONDARY
RELIABLE INSULATED
STRAIGHTLINE
SPLICE

Reliable Insulated Straightline Splices, with neatly fitting fuse clips, simplify secondary banking. A full range of sizes are available.

Inserted in the line without deadending or cutting in additional wire. Installed on secondaries without removing wires from structure. These splices make a neat and dependable job.

Reliable
ELECTRIC COMPANY
OVER 30 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE CHICAGO


B&W
OPEN-PASS
BOILER
ROOM AIR FROM FORCED-DRAFT FAN
GASES TO INDUCED-DRAFT FAN AND STACK
AIR HEATER
HOT AIR TO BURNERS
SUPERHEAT CONTROL DAMPER
ECONOMIZER
HOT AIR TO BURNERS
RAW COAL
HOT AIR
SUPERHEATER
FEEDER
RAW COAL
PULVERIZED COAL LADEN AIR
STEAM
SLAG
DRY ASH
FAN
PULVERIZER

A Pound of Prevention

The B&W Open-Pass Boiler is a new type of unit that attacks at its source the problem of tube fouling caused by slag in high-temperature high-capacity boilers. The design is such that a considerable quantity of the ash is eliminated ahead of the convection surface in the boiler, and, at the same time, the remainder of the ash is conditioned so that it is relatively harmless as it passes over the convection surface.

In high-capacity boilers of conventional designs, the problem of tube fouling has been accentuated largely because high-temperature steam requirements necessitate the superheater being in a zone of high-temperature gases and, therefore, without the protection of boiler tube banks to the extent previously employed in lower temperature units.

The Open-Pass Boiler meets and solves this problem.

The slag-tap furnace of this unit which, during operation, has liquid ash covering its walls and floor, is ideally suited for ash elimination. The molten slag on these surfaces functions effectively in retaining ash particles coming in contact with it, these slag accumulations running down the walls continuously to be discharged through the slag-tap opening in the furnace floor.

On leaving the primary furnace the gases travel at high velocity through long, open, water-cooled passes that provide a transition stage in which the ash leaving the primary furnace in suspension in the gases, passes from the fluid state, through a plastic sticky state, to a dry granular form.

A large part of the slag particles carried in suspension into the first open pass deposits on the walls, and, being at a high temperature, is removed naturally by flowing down onto the floor of the primary furnace and through the slag-tap opening. In the second open pass, the ash is dry and is discharged with the aid of downwardly flowing gases to the dry-ash hopper. The downflow of gases at relatively high velocity promotes self-cleaning and uniform gas temperature across the pass, without lanes of higher-than-average temperature gases that would exist with a slower, upward flow of gases in a larger chamber. Added to this downflow is a U-turn of the gases, which, together with a reduction in their velocity before they enter the superheater, provides an arrangement that ensures further effective removal of ash and materially reduces the quantity of ash reaching the convection superheater tubes, with gases at a more nearly uniform temperature across the entire width of the tube bank than is possible with more conventional designs. Thus, there is little opportunity for gas lanes at higher-than-average temperature to cause tube fouling.

It is in this manner that the slag problem is approached with the B&W Open-Pass Boiler —with a pound of prevention instead of the proverbial ounce—by attacking the *cause* of slag fouling.

Visitors to the New York World's Fair can find, at the B&W Exhibit in the Power Building (at the eastern end of the Bridge of Wings), an interesting visualization of the action of this unit.

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET . . . . NEW YORK, N. Y.

BABCOCK & WILCOX

G-185-T

OBITUARY

Harry R. Woodrow

Harry R. Woodrow, vice-president of Consolidated Edison Co. of New York, Inc., whose death was announced in the August 17 issue of ELECTRICAL WORLD, was first employed by Edison system companies when he joined the New York Edison Co. in 1911 as assistant to the chief electrical engineer. In 1917 he became assistant chief electrical engineer, the position he held until 1921, when he went with Stone &

Webster, Inc. In 1922 he was for six months general engineer with the Westinghouse Electric & Manufacturing Co., leaving that place to join the Brooklyn Edison Co. in the capacity of assistant electrical engineer. In 1926 he was appointed electrical engineer and six years later became vice-president. In 1937 he was elected vice-president of Consolidated Edison and at the time of his death was in charge of design, planning and inventory.

Mr. Woodrow held numerous patents on electrical devices and equipment. He was active in engineering organizations, having served on various committees of the American Institute of Electrical Engineers, National Electric Light Association, American Standards Committee, Association of Edison Illuminating Companies. He was born in Luverne, Minn., April 15, 1887.

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▶ SIDNEY BORDEN PAINE, 84, pioneer textile electrification specialist and for 34 years manager of the mill power department of the General Electric Co. at Boston, died at his home in Auburndale, Mass., August 14. He was a native of Fall River, Mass., and was graduated from the Brooklyn Polytechnic Institute in 1875. In 1881 he became connected with the Edison Electric Co. at Fall River, transferring to Boston two years later as manager of the New England district. In 1892 he entered upon a distinguished career as head of the mill power department of the General Electric Co., and was identified with numerous installations of electric power in the textile field, with extensive European travel and active connection with industry organizations in America. He retired in 1926 after receiving many honors, including a former vice-presidency of the Edison Pioneers, a medal from the New England Cotton Manufacturers' Association for "improvements in the art of electrical transmission of power" and honorary membership in the National Association of Cotton Manufacturers.

▶ WILLIAM P. SCOTT, one of San Francisco's prominent electrical contractors, died July 20, following a heart attack. Mr. Scott was 70 years of age. As president of the Scott Co. he carried out contracts for many of the city's outstanding business establishments.

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Recent Rate Changes

TAMPA ELECTRIC CO. has been ordered by the city utility board to reduce domestic and commercial rates 30 per cent, or $635,000 annually.

BROOKLYN EDISON CO. has been authorized by the New York Public Service Commission to put into effect revised rates for large users of electricity which will save such consumers $80,350 a year. The new rates became effective August 1.

DES MOINES ELECTRIC LIGHT CO. has reduced its electric rates to residential consumers, $31,370; retail business, $33,870; retail commercial service, $10,336; service to the city for street lighting, $3,028 and $1,900 for city buildings.

NEW YORK STATE ELECTRIC & GAS CORP. has been authorized by the state Public Service Commission to revise its electric rates to save consumers in the Mechanicville district approximately $1,400 per annum. The lower rates became effective as of August 12 and will apply to Mechanicville, Stillwater and surrounding towns in Saratoga and Rensselaer counties.

ILLINOIS COMMERCE COMMISSION has announced that electric rate changes effective during July resulted in a total reduction of $365,585.

WISCONSIN PUBLIC SERVICE COMMISSION has announced that approximately 108,000 customers of public utilities in the state will save about $427,000 annually through rate reductions ordered and authorized during the first six months of 1940. Largest savings will be made by 101,000 customers of electric utilities, who will pay $399,000 less a year for electricity.

NEW YORK PUBLIC SERVICE COMMISSION has granted the village of Greene, Chenango County, permission to put into effect revised electric rates which will save residential and all-purpose commercial consumers approximately $3,400 annually. Under the new filing small consumers will receive the largest reduction. The new rates will become effective September 1.

Let These Consistent Advertisers Tell You:

Good Advertising Pays in

Electrical World

WORKS CONTINUOUSLY

"ELECTRICAL WORLD has continuously carried our advertising — clear proof of the advertising job this magazine is doing for us."

ALLIS-CHALMERS MFG. CO. . . . *since 1904*

HELPED BUSINESS CHANGE

"Our company was successful in making a radical change in the character of its business during depression years, principally through advertising in ELECTRICAL WORLD."

AMERICAN TRANSFORMER CO. . . . *since 1901*

44-YEAR ALLY

"Our organization began using your publication 44 years ago and has been 'at it' ever since."

JAMES G. BIDDLE CO. . . . *since 1896*

UPS BUSINESS

"Four years after starting our advertising campaign in ELECTRICAL WORLD our sales figure was exactly 40 times greater than before we started this campaign. Eight years later it was almost 80 times greater, and this in spite of the fact that nationally the general purchase of this material was going down rather than up."

BREWER-TITCHENER CORP. . . . *since 1928*

RIGHT AUDIENCE

"ELECTRICAL WORLD supplies us with an audience we want to reach with messages on Buss Superlag fuses."

BUSSMANN MFG. CO. . . . *since 1918*

COMPETENT

"ELECTRICAL WORLD, as a competent and comprehensive industry paper, provides us with a direct route to the minds of the engineer group, which designs, specifies and operates — the executive group, which approves capital expenditures."

COMBUSTION ENGINEERING CO. . . . *since 1918*

PREFERRED

"We always found ELECTRICAL WORLD to be preferred and to be read in every branch of the industry and by every type of individual that we were interested in reaching."

CONTINENTAL-DIAMOND FIBRE CO. . . . *since 1907*

DEFINITE RESPONSE

"We had a definite response from utilities all over the country proving that the advertising pages of ELECTRICAL WORLD are seen and read by the men we want to reach."

CRESCENT TOOL CO. . . . *since 1927*

INFLUENCES FIELD

"It helps us sell our product within the field of its influence."

ELECTRIC STORAGE BATTERY CO. . . . *since 1900*

WINS SALES SUCCESSES

"Thirty years of steady advertising in ELECTRICAL WORLD has unquestionably contributed materially to the recognition we enjoy and the sales successes we have won."

G & W ELECTRIC SPECIALTY CO. . . . *since 1910*

PURCHASING GUIDE

"ELECTRICAL WORLD is one medium which serves the operating men in the electrical transmission and distribution field in the capacity of current news of the industry as well as a purchasing guide."

JAMES R. KEARNEY CORP. . . . *since 1927*

MOST GRATIFYING

"ELECTRICAL WORLD has done its part of our sales job in a most gratifying manner."

LAPP INSULATOR CO. . . . *since 1917*

RESULTS

"ELECTRICAL WORLD, through the years, has been used consistently, dominantly and resultfully."

OHIO BRASS CO. . . . *since 1901*

SALES AID

"Our business has been helped by using it as a medium for giving information about our many products."

OKONITE COMPANY
. . . *since the '90s*

INCREASES SALES

"Our series of advertisements in ELECTRICAL WORLD has helped our products 'sell themselves' and has been an important factor in increasing our sales."

PACIFIC ELECTRIC MFG. CORP. . . . *since 1907*

50-YEAR VALUE

"50 years of continuous advertising would seem to indicate our opinion of the value of ELECTRICAL WORLD as an advertising medium."

SIMPLEX WIRE & CABLE CO. . . . *since 1890*

Electrical World

Serving a Huge and Ever-Growing Market

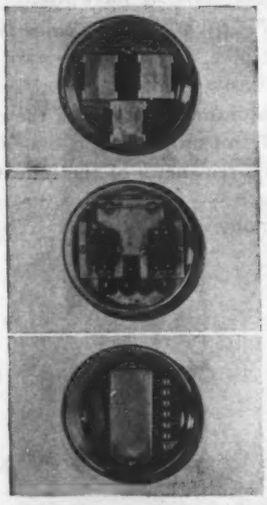
A McGraw-Hill Publication, 330 W. 42 St., N. Y. C.

No. 9 of a series of factual messages designed to demonstrate that GOOD ADVERTISING *in a leading business publication will invariably increase sales.*

ANNOUNCING

the development of a line of small transformers which employ the detachable principle devised for socket-type watt-hour meters.

Also adapter-type units to accommodate the transformers plus one or two meters to a single-socket position.



3-phase, 4-wire Reactive Meter Transformer — with switch

3-phase, 3-wire Reactive Meter Transformer — with switch

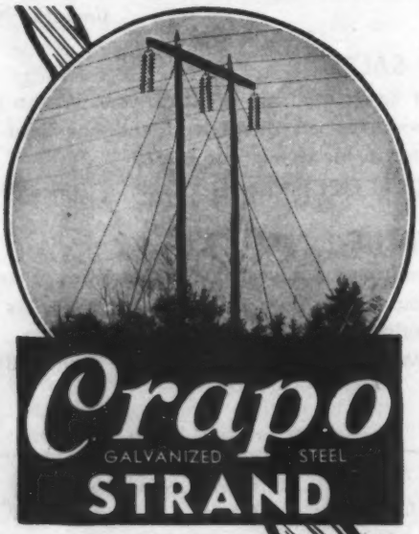
150-watt Socket-type Low voltage Tap Transformer

WRITE US about your metering problems so we can recommend the proper units to solve them.

SPARKES MANUFACTURING COMPANY

Socket-Type Auxiliary Transformer Equipment

318 Jefferson Street, NEWARK, N. J. Market 3-0919



STRENGTH, ruggedness and durability are combined with definite economy in *Crapo* Galvanized Steel Strand. Low first cost, low maintenance expense are matters of record wherever this time-tested product is in use. Available in all standard grades and sizes from representative jobbers throughout the country. Or, write—

INDIANA STEEL & WIRE CO.
MUNCIE, : : INDIANA

Sales Opportunities

CHINO, CALIF.—Southern California Edison Co., Los Angeles, has secured permission from State Railroad Commission to proceed with construction of new steel tower transmission line from Boulder hydro-electric power plant of Federal Government, Boulder Canyon, Nev., to Chino, about 200 miles, where connection will be made with terminal power substation of company. This will be the second transmission line of company between these points; it will operate at 230,000 volts and is estimated to cost close to $3,550,000. Work will begin soon. In conjunction with new line, company plans power substation at Pisgah, Calif., for switching service, estimated to cost about $315,000.

ST. LOUIS, MO.—Monsanto Chemical Co., 1700 South Second Street, has approved plans for addition to steam-electric power plant, to be used for expansion in turbine department, where additional equipment will be installed. Work will be placed under way at once. Stone & Webster Engineering Corp., 49 Federal Street, Boston, Mass., is consulting engineer.

DETROIT, MICH.—Briggs Manufacturing Co., 11631 Mack Avenue, manufacturer of automobile bodies, plans installation of motors and controls, duct lines, switchgear, conveyors, electric hoists and other equipment in one-story addition to plant, totaling about 150,000 sq.ft. of floor space, to be used for production of metal wings for airplanes and other aircraft parts, a new branch of output for company. Cost reported over $400,000. Work on superstructure is being placed under way.

NORFOLK, VA.—Bureau of Yards and Docks, Navy Department, Washington, D. C., will receive bids (no closing date stated) for engine-driven electric generator, steam receiver, separator and switchgear, for installation in power station at naval hospital, Norfolk (Specifications 10061).

NEWPORT, KY.—Union Light, Heat & Power Co., Cincinnati, plans expansion and improvements in power plants and system in different parts of territory in Kentucky and Ohio, including transmission and distributing lines, power substations and other facilities; extensions will be made in rural electric system. Company has secured permission from Kentucky State Public Service Commission to arrange financing in amount of $3,176,400 through sale of stock, portion of proceeds to be used for purpose noted.

CLAY CENTER, KAN.—City Council has been authorized at special election to arrange bond issue of $150,000, proceeds to be used for expansion and improvements in municipal power plant, with installation of equipment for increased capacity. Work will be carried out in fall. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

CHICAGO, ILL.—Sherwin-Williams Co., 101 Prospect Avenue, N.W., Cleveland, Ohio, manufacturer of paints, varnishes, oils, etc., plans installation of motors and controls, duct lines, switchgear, regulators, conveyors, loaders and other equipment in new one-story plant addition at Kensington Avenue and 119th Street, Chicago, 300 x 700 feet. Cost estimated about $750,000. Albert Kahn, Inc., New Center Building, Detroit, Mich., is architect and engineer.

BROOKLYN, N. Y.—Signal Corps Procurement District, Army Base, Fifty-eighth Street and First Avenue, Brooklyn, receives bids until September 5 for 50,500 to 202,000 lineal feet of telephone cable, and 46,460 to 303,000 lineal feet of telephone cable (Circular 72).

AUSTIN, TEX.—Municipal Light and Power Department, Walter Seaholm, superintendent, plans improvements in transmission lines from Miller dam to city power plant, including line reinforcement in loop system and other work. Also plans expenditure of about $30,000 for oil circuit breakers for station installation to stabilize power loop system. At later date it is proposed to construct new power substation in western part of city.

THIEF RIVER FALLS, MINN.—City Council is arranging immediate call for bids for extensions and improvements in municipal power plant, including installation of additional equipment.

SAN JUAN CAPISTRANO, CALIF.—Southern California Edison Co., Los Angeles, plans early construction of new transmission line from connection with power substation at Chino, Calif., to terminal station at San Juan Capistrano, where connection will be made with transmission system of San Diego Consolidated Gas & Electric Co., San Diego, Calif., for interchange of power supply.

BAY CITY, MICH.—Dow Chemical Co., Midland, Mich., plans installation of transformers and accessories, switchgear, motors and controls, duct lines, conveyors, electric hoists and other equipment in four new one-story additions to Dowmetal (magnesium alloy) plant at Bay City, totaling about 120,000 sq.ft. of floor space, to provide close to 400 per cent increase in present capacity. Work on initial unit will begin soon. Entire project will cost about $850,000.

PORTLAND, ORE.—Purchasing Officer, Bonneville Power Administration, Department of Interior, 811 N. E. Oregon Street, Portland, receives bids until September 3 for three 13,200-volt, 50-amp., single-phase, air-cooled, outdoor-type, current-limiting reactors (Circular 1258); also, until August 30, for terminal panels, wireways, and outdoor power substation service and transformer cabinets (Circular 1263).

RADFORD, VA.—Hercules Powder Co., Delaware Trust Building, Wilmington, Del., plans installation of transformers and accessories, motors and controls, switchgear, duct lines, conveyors, regulators and other equipment in new plant on 2,500-acre tract of land near Radford, for production of smokeless powder for federal government, with which contract has been made to construct and operate mill, title to plant and property to be retained by War Department. It will consist of large group of buildings, equipped for capacity of about 200,000 pounds of smokeless powder per day. An electric power plant is planned. Work will be placed under way at early date, with completion scheduled next spring. Cost about $25,000,000.

CANTON, OHIO—Ohio Power Co., Newark, Ohio, has approved plans for new indoor-type power substation at Canton. Award for building has been made to Gibbons-Grable Company, Canton, and work will proceed at once. Transformers and other equipment will be installed.

CHICAGO, ILL.—Signal Corps Procurement District, 1819 West Pershing Road, receives bids until September 5 for five to 30 switchboards in one lot, and for 20 switchboards in another lot; also for telephone battery feeds and miscellaneous equipment (Circular 57).

Municipal Plants

CARROLLTON, MO.—Missouri Supreme Court upheld the right of the city to build a municipal electric light and water plant. The high court reversed, however, a Carroll County Circuit Court ruling that the Kansas City Power & Light Co.'s franchise in Carrollton had terminated. The town's failure to purchase the company's plant under terms of the 1919 franchise agreement automatically renewed the franchise, the high court held.

NEW LONDON, MO.—A $29,500 bond issue for a municipal power and light system was defeated on August 2 for the third time, but Mayor John Gingry announced another election probably would be held in about 30 days. With a two-thirds majority required the vote showed 297 in favor of the issue and 207 against.

NORTH BALTIMORE, OHIO—Village Solicitor, Daniel W. Redden, has filed a mandamus action in the state Supreme Court to force a referendum vote on a municipal light plant ordinance. Last year, in a legal battle over a referendum vote on the proposal, the Ohio Supreme Court ruled the project could proceed. The village administration, however, decided against going forward under the original ordinance and adopted another. Referendum petitions were filed against the new ordinance, but village officials refused to provide for the referendum. The ordinance in question provides for a $127,200 bond issue, to be supplemented by a WPA grant. Meanwhile, the Central Ohio Light & Power Co. filed suit in Wood County Common Pleas Court at Bowling Green against the Village of North Baltimore to restrain the village from issuing bonds to pay for a municipal electric power plant. The suit claims the provisions of the law have not been carried out for the issuance of $127,200 in bonds approved at an election in 1939.

MINEOLA, TEX.—In a recent election the proposal to issue $250,000 bonds for the construction of a municipally owned electric light and power plant was defeated by a vote of 461 against 102 votes for the project. Texas Power & Light Co. now supplies the city.

SOUTH HILL, VA.—Virginia Supreme Court of Appeals has granted an appeal to the town in the case involving the right of the town to construct an electric power plant at a cost of $150,000. Virginia Public Service Co., which serves the town, has contested the validity of the contract for building the plant. The Circuit Court of Mecklenburg County held that the revenue certificates proposed to be issued under the provisions of the contract were invalid as being in conflict with the provisions of Section 127 of the Constitution of Virginia.

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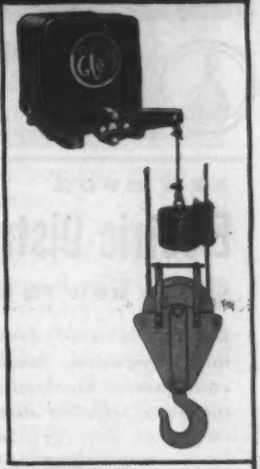
Restrain Indiana Tax Board

Indiana State Tax Board has been restrained from certifying an increase of $4,056,035 in the over-all assessed valuation of the Northern Indiana Public Service Co. and the Chicago District Electric Generating Corp. Judge in Superior Court in Indianapolis set September 3 for hearing to determine whether the restraining order should be permanent.

This CAN'T HAPPEN HERE

WHEN CRANE IS EC&M EQUIPPED *with a*

Youngstown SAFETY LIMIT STOP



Here's the SAFETY *and* CONVENIENCE *men appreciate*

IN THE operation of overhead cranes, the Youngstown Safety Limit Stop is as important as a safety valve to a boiler. Thousands of installations testify to its value in protecting life and property.

It not only eliminates overhoisting accidents but removes the mental hazard of an accident, resulting in notably better work by the operator. Entirely automatic, the Limit Stop resets as the hook is lowered out of the danger zone.

Contributing also to more efficient operation is full magnetic control . . . consisting of small, compact master switches which are easy to operate and can be conveniently grouped within easy reach.

Only a small part of the cost of the crane, these products by giving the safety and convenience men appreciate, are often an important factor in improving personnel relations. Ask for complete details about EC&M Crane Control Equipment.

THE ELECTRIC CONTROLLER & MFG. CO.
CLEVELAND, OHIO

Look for this Trade-Mark when you buy — specify it when you order

MOTOR CONTROLS • BRAKES • LIMIT STOPS • MAGNETS

SAVE—Those Short Lengths of COPPER WIRE

You Can Reclaim Them Easily at a Very Low Cost

by Splicing them with Nicopress SLEEVES

- Make those "shorter lengths" available for service by splicing them with Nicopress Sleeves.

Completed splices are small and neat. Conductors will pull easily over cross arms as sleeves are bevelled at both ends. The diameter of the splice is not much greater than the diameter of the wire. Nicopress splices are strong and tight, equaling or exceeding the rated breaking strength of conductors. Here's a way to make real savings. Order from your jobber today.

Nicopress Sleeve *Completed Nicopress Splice*

THE NATIONAL TELEPHONE SUPPLY CO.

5100 SUPERIOR AVE., CLEVELAND, OHIO

Canadian Mfr.—N. Slater Co., Ltd., Hamilton, Ont.

Export Distributor—International Standard Electric Corp., New York, N. Y.

NEW BOOK

Electric Distribution Fundamentals

Just Out

SHOWS HOW TO SOLVE

the problems of design, construction, operation, service, methods, equipment, mechanics, and materials of electric distribution

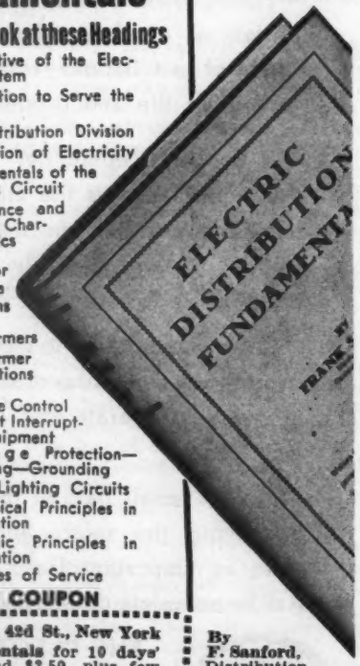
From a non-engineering viewpoint, this book outlines features of both utility distribution and the industrial and inside wiring branches of service to the outlet.

THE ABC OF ELECTRIC DISTRIBUTION

Tells how the distribution system is designed and built, how it works, and how it is serviced and operated; explains equipment and its use, design of carrying lines, problems of maintaining flow, and materials; discusses how distribution fits in economically with the general system of electric supply; covers voltage drop, wire size calculation, power factor, etc., etc. Practical design problems are included with solutions based on diagrams instead of difficult mathematics.

Look at these Headings

- Perspective of the Electric System
- Distribution to Serve the Load
- The Distribution Division
- Generation of Electricity
- Fundamentals of the Electric Circuit
- Inductance and Related Characteristics
- Tools for Electrical Problems
- Transformers
- Transformer Connections
- Voltage Control
- Current Interrupting Equipment
- Voltage Protection—Lightning—Grounding
- Street Lighting Circuits
- Mechanical Principles in Distribution
- Economic Principles in Distribution
- Measures of Service



10 DAYS' FREE EXAMINATION—MAIL COUPON

McGRAW-HILL BOOK COMPANY, Inc., 330 West 42d St., New York

Send me Sanford's **Electric Distribution Fundamentals** for 10 days' examination on approval. In 10 days I will send $2.50, plus few cents postage, or return book postpaid. (We pay postage on orders accompanied by remittance.)

Name .....

Address .....

City and State .....

Position .....

Company W-8-24-40

(Books sent on approval in U. S. and Canada only.)

By F. Sanford, Distribution Engineer, Cincinnati Gas & Electric Co.

242 pages
156 illustrations
15 tables
1 chart

$2.50

Steam Station Designed As Hydro Adjunct

[*Continued from page 39*]

openings near "throat" of furnace, thus creating turbulence and permitting operation at widely varying rates of combustion with maintenance of high CO_2 but without CO or smoke. At maximum output the combustion rate is about 50 lb. per hour per square foot of stoker grate area.

Expectations Met

In the period since Orem emerged from its initial starting runs in the fall of 1936 it has operated about 11,000 hours, or 40 per cent of elapsed time. During 1939 it operated 4,200 hours and showed an average economy of 15,550 B.t.u. per net kilowatt-hour. Comparing this with design expectations an accompanying illustration shows the heat balance at point of best economy (15,000 kw.) and at 1 in. Hg absolute back pressure, with an expected performance of 15,200 B.t.u. per net kilowatt-hour at a boiler efficiency of 75 per cent, which is approximately one point above guaranteed boiler unit efficiency. It is therefore evident that station performance has measured up well to design expectation. While energy demands in the years 1937-39 did not necessitate operation of Orem throughout any one year, the station has had a good availability record in the last two years. In 1937 week-end boiler outages were required about every six weeks to permit removal of ash accumulation on walls of furnace and tubes of boiler, but improvements in operating methods have now made it possible to lengthen the periods between such outages to as long as three months and make the unit available 95 per cent of time if needed.

Success in achieving these results in design and operation of Orem station has been made possible by close co-operation between the operating company and the service organization (now Ebasco Services, Inc.), which acted as consulting engineer on this development.

•

Safety Code Handbook

The National Bureau of Standards, Department of Commerce, has made available a handbook containing Part 1 of the revised (fifth) edition of the National Electrical Safety Code.

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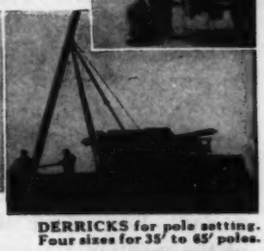

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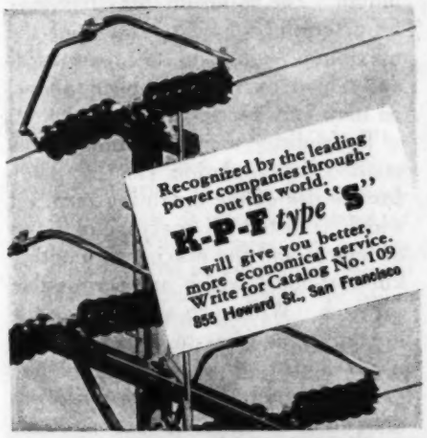
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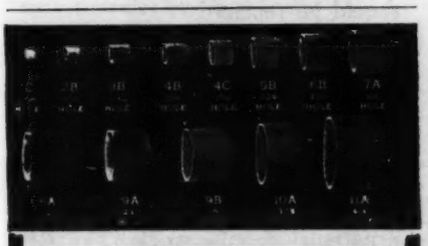

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Automatic Zone Substation Has Many Refinements

[*Continued from page 44*]

charcoal which provides a good contact between the surface of the copper tube and the earth. Holes for these ground wells were dug with well-digging machinery.

There is no house bank. Auxiliary 240-volt, three-phase and 240/120-volt, single-phase, three-wire, a.c. power is supplied from service mains in the street, which have sufficient power continuity and reliability for this service. A 120-amp.-hr. storage battery (chloride accumulator type) is provided, together with well-braced metal supporting rack, so that the jars will not be broken or fall off the rack during severe earth movements. The station battery is used to supply 125-volt d.c. power for operation of oil circuit breakers, relays and a few emergency lights. The battery is protected with copper fuses of such rating that they will not blow unless the battery is short circuited.

All conduits are installed exposed and are supported on racks mounted near the ceiling. They are the thin-wall type using threadless fittings. Large boxes are provided for pulling and splicing control wire. The control wire is rubber-insulated, braid covered; the insulation is rated as corona resisting.

Prismatic glass fixtures are used for lighting. Intensity is about 10 ft.-candles over the floor area.

Grounding of bus and feeder terminals in metal-clad lift-up switchgear presented a problem. To meet this, three dummy switch studs were mounted on a portable steel frame so arranged that the assembly used to ground the feeder terminal of the switchgear could not under any condition be used to ground the bus.

Conversely, the bus-grounding device cannot be used to ground the feeder terminals.

A red nameplate with white letters suitably marked is mounted on each assembly to distinguish one device from another.

Two feeder-grounding devices and one bus-grounding device are supplied for both the 4-kv. and 12-kv. metal-clad switchgear. Individual assemblies are mounted on casters for mobility. Dummy studs are connected together with a copper bar, which, in turn, is connected to the station ground system by a heavily insulated cable.

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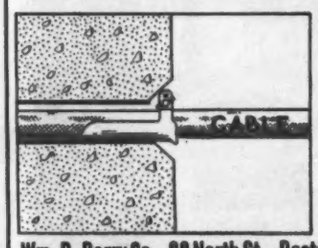

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Retire Old Meters by Plan

[*Continued from page 52*]

economics, the old meter should be removed and junked when the loss of revenue due to under-registration equals the annual fixed charges on a new meter, provided, of course, that the cost of making such a replacement is not excessive. For example, there would be no justification for spending $2 or $2.50 in labor and transportation to replace the meter of a rural customer if the loss of revenue from under-registration was only $1.05 per year.

Relatively Recent Meters

The next type of meter, those in Group No. 3, were built between 1926 and 1934, and because of their recent design and good operating characteristics do not present a retirement problem. Meters in this group have good accuracy even at 300 to 400 per cent load and will under-register only a negligible amount on customers using around 75 kw.-hr. per month. It is believed that there will be a wide application for meters in this class for a number of years to come.

However, consideration must be given to the present value of these meters in cases where major repairs become necessary. Some meters in this group are as much as 14 years old, and it would prove more economical to junk such a meter rather than to spend an amount equal to or greater than its present depreciated value for repairs.

In the discussion of the Group No. 2 meters the statement was made that an old meter should be retired when the value of the energy which passes through it without registering is equal to the annual fixed charges on a new meter. To make this principle applicable, however, it is necessary to have some convenient method of estimating the under-registration. The only continuous record available for every customer is the monthly meter reading, and therefore a plan has been worked out which uses kilowatt-hours consumed as a measure of demand and under-registration. It is believed that this method results in a reasonably accurate estimate of under-registration for those customers on the system from which the data were obtained.

If graphic ammeters are installed so as to record the current consumption of a number of typical customers using, say, 100 kw.-hr. per month, charts will be obtained from which it is possible to find the average number of hours per day the customer's maximum demand was used. For 100 kw.-hr. per month this worked out to be 0.82 hour in the case shown. By means of ammeter charts on typical customers who have monthly kilowatt-hours of 50, 150, 200, etc., a series of these values may be arrived at. These, when plotted against kilowatt-hours per month, will result in a curve. From these same ammeter charts the shape and characteristics of the typical customer load curve may be found. Knowing these factors, empirical daily load curves may be plotted which would, if repeated 30 times, equal the desired monthly kilowatt-hours. From such a daily load curve the percentage of the monthly kilowatt-hours which are consumed during the peak load periods may be calculated.

A curve may then be plotted showing the relationship between maximum hourly kilowatt demand and consumption in kilowatt-hours per month. The points on this curve may be determined by integration of the maximum hour on the empirical daily load curves mentioned above, or they may be calculated.

To facilitate the application of this method, a tabulation can be made for the use of the operating men, on which is listed all makes and types of meters and the maximum monthly kilowatt-hours which are permissible for each. With such a tabulation the operating man has to know only the make and type of meter and the monthly kilowatt-hours in order to determine whether or not a meter should be replaced.

Don't Hope for It

[*Continued from page 58*]

each district or unit which would be obligated!

So the whole picture is being given a national defense angle. The RFC will loan the money, and, with so much federal pork greasing the ways, maybe the horrid fears of bonded indebtedness may be stilled.

And that would be a bad territory to listen over the radio to a debate between Willkie and FDR on public ownership!

LETTERS TO THE EDITOR

"Management and Men"— Management Assistance?

To the Editor of ELECTRICAL WORLD:

Your editorial "Management and Men," page 31, in the July 27 issue of ELECTRICAL WORLD, is interesting, timely and very true. Also, the cure is simple.

Under present conditions management is so busy it does not have time to tend to operations, or what we used to call the utility business. The cure is good management assistance with ability and time to look after these things.

There are many men who have proved their ability who are available for this type of work and whose employment would be a good investment.

J. GARDNER MENUT,
Securities and Exchange Commission
Washington, D. C.

•

Non-Appreciative Management Attitude Toward Employees

To the Editor of ELECTRICAL WORLD:

This refers to the editorial comment appearing on page 31 of the ELECTRICAL WORLD dated July 27, 1940.

The three utility employees who wrote you the letters referred to in the editorial are to be congratulated for their initiative and courage in calling public attention to a situation which in my opinion is greatly in need of correction. Furthermore, you are to be congratulated on your quick perception that this subject should be pointedly brought to the attention of responsible executives of utility companies.

For almost twenty-five years I have worked in the public utility field as an employee of both holding and operating companies and regulatory commissions. I have had unusual opportunities to observe the reaction of employee groups to the attitude and actions of management. Utility employees as a group will rate far above the average in intelligence and in any given situation they readily perceive insincerity or pretense on the part of management. It has seemed to me that in the attitude of management toward its employees there is frequently too much of the feeling that the employee is "lucky to have a job." This attitude and others must be changed if management would dissolve the existing lip service loyalty of employees and replace it with an inward loyalty springing from the consciousness that in all

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respects employees and the public are being treated fairly and honestly.

It will be admitted that here and there one will find important employee groups that have been fairly and even generously treated by management; such instances are marked by an unusually high standard of employee performance. Employees in such groups are loyal and industrious. On the other hand, it is frequently true that management by its own shortsighted or selfish acts has destroyed or made spurious those priceless qualities of personnel — loyalty to the boss and enthusiasm for the job.

Your editorial is timely and forceful. It is earnestly to be hoped that it will serve to focus the attention of management on one of its most important present-day problems. Perhaps a further warning should be sounded that a real danger may lie in the natural delusion of individual managements that all is well in their own organization.

CHIEF ENGINEER,
A Public Utility Commission.

•

Fluorescent Power-Factor Rates Not Discriminatory

To the Editor of ELECTRICAL WORLD:

The editorial in the July 13 issue of ELECTRICAL WORLD and comments in earlier issues on fluorescent lighting criticize the electric power companies for their treatment of the problem of the low power factor of such installations. I would like to comment on your opinion that the power-factor corrective requirements now being embodied in rate schedules for this service are discriminatory to a noteworthy extent.

The problem of low power factor has been with us for many years and has been dealt with in various ways, depending upon its seriousness and definiteness. In the field of small power it is so general and uniform that it is readily and equitably taken care of in the rate itself. Wholesale power applications lack such uniformity and have been dealt with in other ways, usually by adjustments in demand charges.

Power-factor complications in the fields covered by lighting rates are relatively new. For residential service low power factor can be provided for in the blocks in the rate which cover such applications as refrigeration. The real problem is in commercial lighting, which until recently had almost ideal power-factor conditions. The introduction of neon signs caused comparatively little concern because they were a minor part of the illumination load, required special equipment and, when appropriate, could be subjected to a

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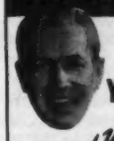

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supplementary demand charge to cover the added capacity which their low power factor required.

Fluorescent lighting is of a quite different character. It is a part of the general lighting load and inseparably connected with it. What you characterize as the "pet peeve of utilities" is, in reality, a conception that this new lighting technique, which may largely replace older lighting methods, involves costs which are not provided for in existing rate schedules. These costs could be provided for by rate adjustments, as is done for other classes of service, or by having the owner of the equipment provide the corrective attachments which eliminate the added service costs. Both the commissions and utilities seem to think the latter procedure is simpler and preferable.

I cannot agree that it is discriminatory to require all customers on a lighting rate that is based on high power factor to have only equipment of that character served thereunder, with such corrective attachments as are necessary to secure that high power factor. In fact, it would be discriminatory to require customers with high power factor to pay a part of the cost of serving others not so equipped.

For such reasons, based on my long experience with rate practices, your claims of discrimination seem to lack adequate foundation.

LUTHER R. NASH,
Ridgefield, Conn.

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BOOK REVIEWS

Electrical Circuits

By members of Electrical Engineering Staff, M.I.T. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York, N. Y. 782 pages, illustrated. Price, $7.50.

As President Compton aptly puts it in the preface, this work is uniquely the product of the electrical teaching staff at Massachusetts Institute of Technology, the first of a projected series which promises to be a unified compendium of electrical engineering as it is taught. One of the objectives, well exemplified in this first volume, is to overcome the tremendous amount of duplication which would occur and has occurred in a multiplicity of books treating electric circuits from the angles of the individualist and specialist.

It is based on the parameters evolved from the theory of fields and proceeds rigorously to develop fundamental networks and the various forms of circuit symmetries. For further generality the transient responses are analyzed ahead of the steady state behaviors. Polyphase systems are set up broadly and the theory of symmetrical components evolved for application to their analysis. Of interest to the system engineer will be the chapter on multi-branch a.c. networks. Circle diagrams are developed as a phase of establishing the loci of complex functions. Electromagnetically coupled systems and a study of transients in nonlinear circuits complete this composite treatise, which well deserves consideration as a basic reference for penetrating circuit technology.

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Books Received

Television Broadcasting. By Lenox R. Lohr. Published by McGraw-Hill Book Company, New York. 274 pages, illustrated. Price, $3.

Electric Circuits and Machine Experiments (a laboratory manual ring-bound), by F. W. Hehre and J. A. Bolmford (Columbia University). Published by John Wiley & Sons, Inc. 279 pages, illustrated. Price, $2.

•

New Funds Allotted for Rural Projects

Allotments totaling $11,397,000 for rural electrification in various states were announced by Harry Slattery, Administrator of Rural Electrification, since the beginning of August.

These allotments provide for the establishment of new co-operatives, the enlargement of others and the installation of additional generating facilities.

Among the allotments are the following:

CALIFORNIA—Surprise Valley Electrification Corp., Alturas, E. G. Keffer, supt., $45,000 for construction of an additional unit in the generating plant.

INDIANA—Fulton County REMC, Rochester, Ralph L. Murray, supt., $136,000 to build 165 miles of line, 506 members in Fulton, Cass, Pulaski and Marshall counties.

KANSAS—P. R. & W. Electric Co-operative Association, Inc., Clyde K. Rodkey, Attorney, $148,000 to build 160 miles of line, 432 members in Pottawatomie, Riley and Wabaunsee counties.

MISSISSIPPI — Southern Pine Electric Power Assn., Taylorsville, H. L. Pickering, supt., $437,000 to build 527 miles of line, 2,150 members in Lawrence, Copiah, Jasper, Newton, Smith, Scott, Rankin, Jones and Simpson counties.

SOUTH CAROLINA—Greenwood County, Greenwood, E. L. Brooks, county supervisor, $126,000 to build 106 miles of line, 426 members in Greenwood, Saluda and Abbeville counties.

WYOMING—Big Horn Rural Electric Co., Basin, Maurice N. Roush, supt., $112,000 to build 132 miles of line, 294 members in Big Horn and Washakie counties.

FLORIDA—Lee County Electric Co-operative, Inc., Fort Myers, H. N. Peterson, president, $101,000 to build 76 miles of line, 379 members in Lee County.

GEORGIA — Amicalola Electric Membership Corp., Jasper, Steve Tate, president, $332,000 to build 341 miles of line, 1,778 members in Pickens, Cherekee, Dawson and Gilmer counties.

KENTUCKY—Jackson County Rural Electric Co-operative Corp., McKee, Lester Reynolds, supt., $117,000 to build 108 miles of line, 463 members in Rockcastle, Jackson, Laurel and Clay counties.

MISSOURI—Scott-New Madrid-Mississippi Co-operative Assn., Sikeston, H. M. Zaricor, supt., $270,000 to build 261 miles of line, 1,018 members in Mississippi, Stoddard, Scott, New Madrid, Bollinger and Cape Girardeau counties.

NORTH CAROLINA—Lumber River Electric Membership Corp., Raeford, N. C., C. A. Alford, president, $428,000 to build 450 miles of line to serve 1,738 members in Hoke, Scotland, Robeson and Cumberland counties. Also $1,151,000 to Wake Electric Membership Corp., Surry-Yadkin Electric Membership Corp., Tri-County Electric Membership Corp. and South River Electric Membership Corp.

OKLAHOMA—Kiwash Electric Co-operative, Inc., Cordell, Ripley Greenhaw, supt., $323,000 to build 460 miles of line, 983 members in Washita, Custer, Kiowa and Dewey counties.

OREGON—Wasco Electric Co-operative, Inc., The Dalles, W. E. Davis, president, $240,000 to build 264 miles of line, 432 members in Wasco County.

TENNESSEE — Appalachian Electric Co-operative, Jefferson City, Alex Chavis, president, $519,000 to acquire and build 320 miles of line, 2,507 members in Jefferson, Grainger, Hamblen and Cocke counties.

TEXAS—Guadalupe Valley Electric Co-operative, Inc., Cost, E. A. Hassman, supt., $190,000 to build 275 miles of line, 644 members in Guadalupe, Gonzales, Lavaca, Wilson, Karnes and Bexar counties.

ALABAMA — Central Alabama Electric Membership Corp., Prattville, Basil Thompson, supt., $225,000 to build 320 miles of line, 746 members in Elmore, Autauga, Chilton, Tallapoosa, Talladega and Coosa counties.

COLORADO—Grand Valley Rural Power Lines, Inc., Grand Junction, Ivan W. Patterson, supt., $115,000 to build 92 miles of line, 312 members in Mesa County.

MINNESOTA—Douglas County Co-operative Light and Power Assn., Alexandria, Clifford R. Hove, supt., $391,000 to build 420 miles of line, 1,318 members in Grant, Douglas, Pope and Todd counties.

PENNSYLVANIA—Central Electric Co-operative, Inc., Parkers Landing, Donald Edge, manager, $233,000 to build 308 miles of line, 884 members in Armstrong, Butler, Clarion, Venango and Forest counties.

ILLINOIS—Tri-County Electric Co-operative, Inc., Mt. Vernon, B. H. Tuttle, supt., $263,000 to build 218 miles of line, 805 members in Marion, Jefferson, Washington, Perry and St. Clair counties.

MAINE—Sandy River Electric Co-operative, New Sharon, Dr. Albert L. Fitch, president, $145,000 to build 150 miles of line, 375 members in Franklin, Kennebec and Somerset counties.

NEW JERSEY—Tri-County Rural Electric Co., Freehold, William Jackman, supt., $40,000 to build 16 miles of line, 63 members in Burlington and Ocean counties, and for rephasing and substation additions.

NEW MEXICO—Farmers' Electric Co-operative, Inc., Clovis, Oliver W. Kimbrough, supt., $48,000 to build 60 miles of line, 156 members in Quay, Curry, Roosevelt counties, N. M., and Deaf Smith, Tex.

VERMONT—Washington Electric Co-operative, Inc., East Montpelier, Clarke Millen, supt., $25,000 to install additional generating equipment in the present plant.

IOWA—Marshall County Rural Electric Co-operative, Marshalltown, Harry H. Frey, supt., $193,000 to build 215 miles of line, 525 members in Story, Marshall, Polk, Jasper, and Tama counties.

VIRGINIA—Powell Valley Electric Co-operative, Jonesville, D. L. McNeil, supt., $215,000 to build 194 miles of line, 902 members in Lee County, Va., and Hancock, Hawkins and Claiborne counties, Tenn.

WISCONSIN—Chippewa Valley Electric Co-operative, Cornell, Raymond L. Cleaves, supt., $103,000 to build 126 miles of line, 381 members in Rusk and Chippewa Counties.

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2—200-kva., General Electric, 2200/220-440 volts.
3—200-kva., General Electric, 13,800/230/460 v.
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3—150-kva., General Electric, 2200/240-440 volts.
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3— 75-kva., Pittsburgh, 2400/120 volts.
2— 50-kva., Kuhlman, 2300/110-220 volts.
3— 50-kva., General Electric, 2200-220/110 volts.
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1	500	450	2300/4000	G.E. Sl. Rg.
1	400	514	440	West. Sl. Rg.
1	350	300	440	G.E. Sl. Rg.
1	350	100	220	G.E. Syn.
2	335	600	2200	G.E., Syn.
1	300	600	2200	G.E. Sl. Rg.
1	250	450		G.E. Sl. Rg.
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35	500/1250	G.E.
30	600/1200	West.
30	225/900	Cr. Wheeler
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